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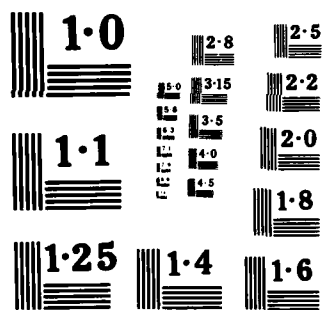
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AD-A156 261

CONNECTICUT RIVER BASIN
CONCORD, VT

MILES POND DAM
VT 00062

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

DECEMBER 1980

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| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The dam is an earth embankment with a concrete outlet structure and emergency spillway about in the center of the dam. It is 19 ft. high and is about 400 ft long. The dam is judged to be in good condition. However, due to the hydraulic inadequacy of the emergency spillway the overall condition is judged to be fair. It is intermediate in size with a high hazard potential. The test flood for the dam is equal to the full PMF. There are various remedial measures which should be undertaken by the owner. | | |

NATIONAL DAM INSPECTION PROGRAM
PHASE I - INSPECTION REPORT
BRIEF ASSESSMENT

Identification Number: VT00062
Name of Dam: Miles Pond Dam
Town: Concord
County and State: Essex, Vermont
Stream: Miles Pond Brook
Date of Inspection: September 30, 1980

Miles Pond Dam is an earth embankment with a concrete outlet structure and emergency spillway approximately in the center of the dam. The dam is 19 feet high and is approximately 400 feet long. Presently the dam serves to raise a natural impoundment of water for recreational use. The appurtenant works consist of a stop log chute spillway, an emergency spillway, and a concrete discharge culvert downstream of the dam. Engineering data pertinent to the original construction of the dam is nonexistent. Available engineering data was limited to design drawings, inspection reports and various records pertaining to the 1969 reconstruction. No record plans were available. Consequently, emphasis was placed on the findings of the visual inspection.

Based upon the visual inspection, the dam is judged to be in good condition. However, due to the hydraulic inadequacy of the emergency spillway the overall condition is judged to be fair. The inspection did reveal potential structure problems, such as, broken and cracked joints of the granite block emergency spillway and concrete erosion of the discharge culvert.

In accordance with the Corps of Engineers' guidelines for the Intermediate size and High hazard classification of the dam, the test flood should be equivalent to the Probable Maximum Flood (PMF). The peak inflow of the PMF to the reservoir is 12,035 cubic feet per second (cfs) and the peak outflow, with the stop logs at the elevation of 98.5 (normal operation level), is 11,270 cfs. The dam will be overtopped by 3.4 feet during the PMF. With water at the crest of the dam, the capacity of the spillways is 2,160 cfs, which is equivalent to 19% of the routed test flood outflow.

The owner should engage a qualified, registered engineer to perform a detailed hydrologic-hydraulic investigation to assess further the potential of overtopping the dam and the need for the means to increase the project discharge capacity.

The following remedial measures should be implemented by the owner under the direction of a qualified registered engineer: develop formal surveillance

and downstream warning plans; and institute a program of annual technical inspection.

The recommendations and remedial measures are described in detail in Section 7. They should be addressed within one year after receipt of the Phase I Inspection Report by the owner.

Very truly yours,

DuBois & King, Inc.

Robert J. Wernecke

Robert J. Wernecke, P.E.
Project Manager



PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these Guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably-possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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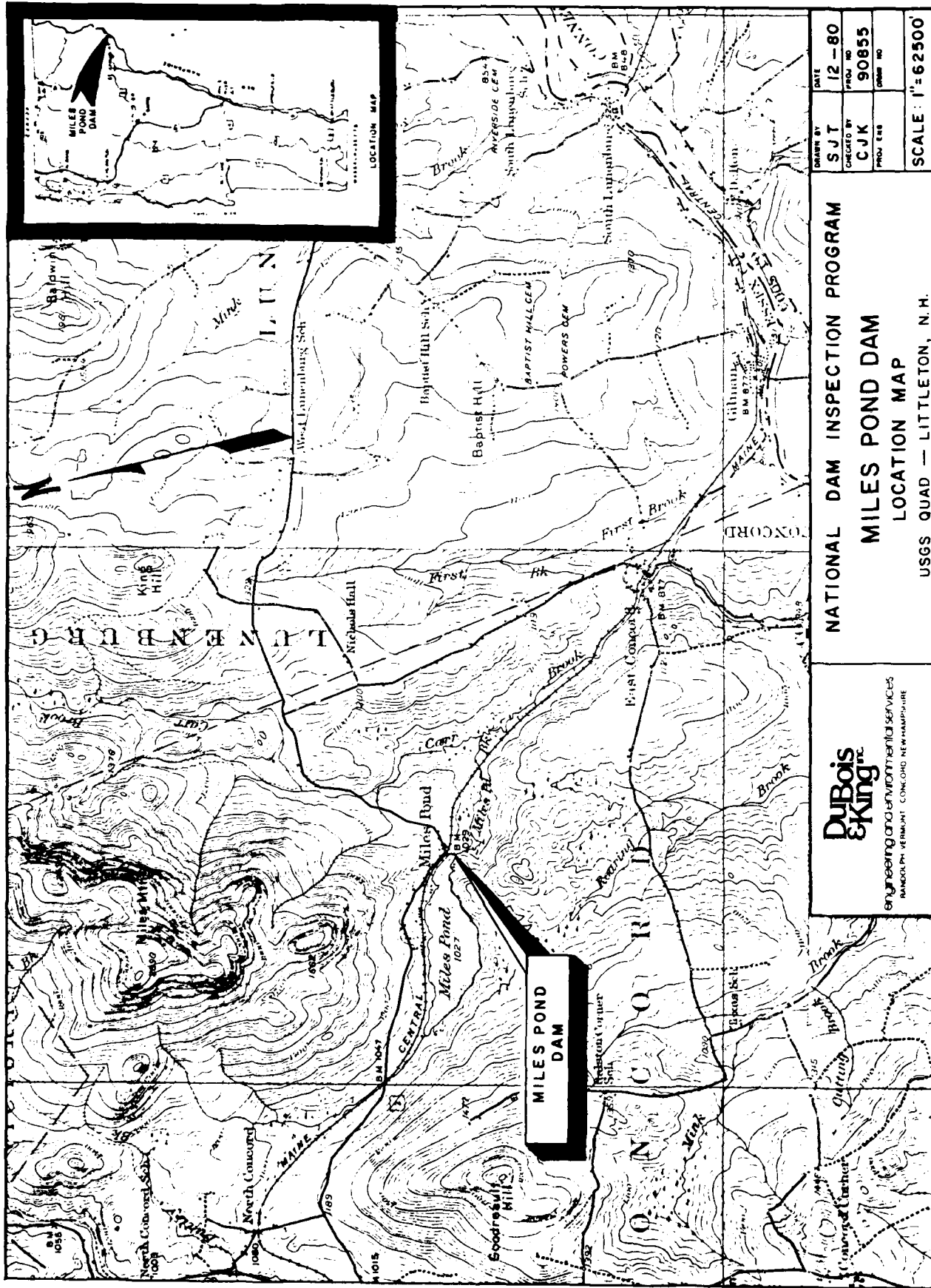
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OVERVIEW PHOTOGRAPH - MILES POND DAM



NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
MILES POND DAM

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. DuBois & King, Inc., has been retained by the New England Division to inspect and report on selected dams in the State of Vermont. Authorization and notice to proceed were issued to DuBois & King, Inc., under a letter of September 11, 1980 from Max B. Scheider, Colonel, Corps of Engineers. Contract No. DACW33-80-C-0003 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection

(1) To perform technical inspection and evaluation of non-federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-federal interests.

(2) To encourage and prepare the states to quickly initiate effective dam safety programs for non-federal dams.

(3) To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location. Miles Pond Dam is located in the Town of Concord, Essex County, Vermont. The dam is located on Miles Pond Brook, approximately 4.2 miles upstream of its confluence with the Connecticut River. The dam is shown on the 7.5 minute U.S.G.S. quadrangle for Miles Pond, Vermont - New Hampshire, with coordinates approximately 71° 47.7' west longitude, 44° 26.7' north latitude. The location of Miles Pond Dam is shown on the location map immediately preceding this page.

b. Description of Dam and Appurtenances. Miles Pond Dam is an earth embankment with a concrete cutoff wall at the outlet structure and emergency spillway approximately located in the center of the dam. The earth embankment top width varies, with a minimum of 10 feet. The side slopes also vary with a maximum slope of 3 horizontal to 1 vertical to a level grade. The dam is approximately 400 feet long and 19 feet high as measured from the invert of the discharge culvert to the top of the dam. The finished grade downstream of the dam is approximately 10 feet below the top of the dam at elevation 92.0 feet. The concrete cutoff wall section of the dam is approximately 125 feet long. The crest of the embankment varies in elevation from 101.3 to 102.5 feet.*

*NOTE: All elevations are based on an assumed elevation of 102.5, taken from the left corner of the concrete cutoff wall.

The outlet structure consist of a principal spillway and an emergency spillway. The principal spillway is a stop log chuted structure with two 4.3 foot wide openings. The sill elevation of the two openings is 92.0 feet. With the stop logs in place the elevation of the outlets is 98.5 feet. The concrete chute spillway discharges into a concrete box culvert, 6.1 feet high by 5.2 feet wide and 280 feet long which in turn discharges into the natural outlet stream.

The emergency spillway, which is adjacent to the principal spillway, has a 12-inch wide sill, 90 feet long at elevation 99.0 feet. The downstream slope of the emergency spillway is lined with grouted granite blocks. At the base of the slope is side channel which diverts the overflow into the same concrete box culvert. The side channel also acts as an energy dissipator for discharges in excess of the box culvert capacity which then flow down a grassed waterway before entering the natural outlet channel.

c. Size Classification. Miles Pond Dam is 19 feet high and has a storage volume of 2,200 acre-feet of water. In accordance with Article 2.1.1 of the Recommended Guidelines for Safety Inspection of Dams, the dam is Intermediate in size based upon its storage capacity which is greater than 1,000 acre-feet but less than 50,000 acre-feet.

d. Hazard Classification. The dam has a hazard classification of High based upon its potential for damage. Development downstream of Miles Pond Dam along Miles Pond Brook is confined to the small rural settlement of East Concord. As the computed breach flood wave approaches East Concord approximately 2.8 miles downstream it will be at a stage of 9 to 11 feet above the streambed at a discharge of 8,400 cfs. Appreciable damage could occur and it is possible that more than a few lives may be lost in areas of East Concord where 3 to 5 housing units are 6 to 8 feet above the streambed. Before the flood wave reaches East Concord, traveling down Miles Pond Brook, the wave inundates two railroad crossings owned by Maine - Central. The flood wave overtops each railroad bridge by approximately 3 feet. The Maine - Central Railroad Co., Mountain Division, is used to ship freight, averaging 1.8 billion gross tons of freight per year.

e. Ownership. The dam is owned by the State of Vermont, Department of Water Resources, Montpelier, Vermont 05062. Contact Mr. A. Peter Barranco, State Dam Safety Engineer, (802) 828-2261.

f. Operator. The dam is operated and maintained by the State of Vermont, Department of Water Resources, Montpelier, Vermont 05062. Contact Mr. A. Peter Barranco, State Dam Safety Engineer, (802) 828-2261.

g. Purpose. The purpose of this dam is primarily to create an impoundment of water for recreational use.

h. Design and Construction History. Based on records available at the State of Vermont Department of Water Resources, prior to 1968 the Miles Pond Dam was owned by Miles Pond Wood Product, Inc. The date of construction of the original dam is not known. The State of Vermont Department of Water Resources acquired ownership in 1968. In 1969, under the direction of The State of Vermont Department of Water Resources, DuBois & King, Inc. of Randolph, Vermont redesigned the Miles Pond outlet structure.

In 1970 after reconstruction of the outlet structure was completed, subsidence occurred in the emergency spillway basin (see photographs of failure in Appendix B). The emergency spillway was repaired by securing the placement of the granite blocks by grouting.

i. Normal Operating Procedure Miles Pond Dam is maintained for recreational purposes. The normal water surface elevation to be maintained in Miles Pond is 98.5 feet, except during the period of October 15 through May 15, the winter level is 1.5 to 2 feet below the normal water surface elevation of 98.5.

1.3 Pertinent Data

a. Drainage Area. The drainage basin of Miles Pond Dam has an area of 6.7 square miles. The land is mostly forested and the terrain is mountainous. The elevations range from 2690 feet at the top of Miles Mountain to 1027 feet which is the elevation of Miles Pond based on the U.S.G.S. 7.5 minute quadrangle map. The basin is sparsely populated with the major development occurring on approximately 30 percent of the Miles Pond shoreline. The maximum lake area represents approximately 5 percent of the total drainage area. The predominant soils in the watershed are Peru-Marlow and Lyman-Marlow-Peru associations.

b. Discharge at the Dam Site.

(1) Outlet Works. The principal spillway is a stop log chute structure which is located in the center of the earth embankment. The stop log chute structure has two 4.3 foot wide openings, as shown on page 3 of 4 in Appendix B and in Photo #8 in Appendix C. The crest elevation of the stop log structure is 92.0 feet, which is approximately 10 feet below the crest of the dam. The stop log structure is the entrance to a concrete chute spillway which discharges into a concrete box culvert 6.1 feet high x 5.2 feet wide.

The maximum capacity of the stop log chute spillway (Crest elevation 92.0) is 550 cfs, with the water surface at the emergency spillway crest (elevation 99). However, under normal operating conditions (refer to Sections 1.2[i] and 2.3) the maximum capacity of the stop log chute spillway was calculated to be 11 cfs based upon the stop logs at elevation 98.5 feet.

(2) Maximum Known Flood. No records were available of past flooding at the site.

(3) Spillway Capacity at Top of Dam. The emergency spillway is a 12 inch wide concrete sill, 90 feet long at an elevation of 99.0. When the water surface elevation is at the top of dam, elevation 102.4 feet, the emergency spillway will discharge 1,920 cfs and the principal spillway will discharge 240 cfs, with stop logs at elevation 98.5, for a total capacity of 2,160 cfs. This represents the total project discharge at the top of the dam. This total project discharge is equivalent to 19 percent of the routed test flood outflow.

(4) Spillway Capacity at Test Flood Elevation. The full PMF test flood inflow for the 6.7 square miles is 12,035 cfs. The surcharge storage of 2,970 acre-feet will attenuate the peak outflow to 11,270 cfs at an elevation of 105.8 feet; this represents an overtopping of the dam by 3.4 feet. The principal spillway at elevation 98.5 will discharge 620 cfs while the emergency spillway discharges 5,430 cfs, for a total discharge of 6,050 cfs or 54% of the routed test flood outflow 11,270 cfs.

(5) Total Project Discharge. The total project discharge at the top of dam is 2,160 cfs at elevation 102.4. During the test flood when the inflow is 12,035 cfs, the total project will discharge 11,270 cfs at elevation 105.8.

c. Elevation (feet)

| | |
|--|-----------|
| (1) Steambed at toe of dam | 83.1 |
| (2) Bottom of cutoff | N/A |
| (3) Maximum | N/A |
| (4) Recreational pool | 98.5 |
| (5) Full flood control pool | N/A |
| (6) Principal spillway crest | 92.0 |
| (7) Emergency spillway crest | 99.0 |
| (8) Design surcharge (Original Design) | Not Known |
| (9) Top of dam | 102.4 |
| (10) Test flood design surcharge | 105.8 |

d. Reservoir Length (feet)

| | |
|-----------------------------------|------|
| (1) Normal pool el. 98.5 | 6200 |
| (2) Flood control pool | N/A |
| (3) Emergency crest pool el. 99.0 | 6200 |
| (4) Top of dam el. 102.4 | 6400 |
| (5) Test flood pool el. 105.8 | 6500 |

e. Storage (acre-feet)

| | |
|-----------------------------------|------|
| (1) Normal pool | 1370 |
| (2) Flood control pool | N/A |
| (3) Emergency spillway crest pool | 1500 |
| (4) Top of dam | 2200 |
| (5) Test flood pool | 2970 |

f. Reservoir Surface (acres)

| | |
|-------------------------------------|-----|
| (1) Normal pool | 210 |
| (2) Flood-control pool | N/A |
| (3) Emergency spillway crest (pool) | 210 |
| (4) Top of dam pool | 216 |
| (5) Test flood pool | 220 |

g. Dam

| | |
|---------------------|--|
| (1) Type | Earth Embankment |
| (2) Length | 400 feet |
| (3) Height | 19 feet |
| (4) Top Width | 10 foot minimum |
| (5) Side Slopes | |
| Upstream | Level to 3:1 |
| Downstream | Level to 3:1 |
| (6) Zoning | No Zoning indicated on design drawings |
| (7) Impervious core | Thin layer of "imp. fill" of undesignated thicknesss beneath riprap on upstream slope, according to design drawings. |

| | |
|---|---|
| (8) Cutoff | 1-foot thick concrete cutoff wall (see drawings Appendix B, Figures 3 and 4) |
| (9) Grout curtain | None shown on design drawings |
| h. <u>Diversion and Regulating Tunnel</u> | |
| Not applicable. | |
| i. <u>Emergency Spillway</u> | |
| (1) Type | Concrete overflow in center of dam |
| (2) Length of weir | 90 feet |
| (3) Crest elevation | El. 99.0 |
| (4) Gate | N/A |
| (5) Upstream Channel | N/A |
| (6) Downstream Channel | Grouted granite block basin and grassed waterway |
| j. <u>Regulating Outlets</u> | |
| (1) Invert | El. 92.0 |
| (2) Length of Weir | (2) - 4.3 feet |
| (3) Description | Stop log structure with (2) 4.3 foot openings which discharges into chute spillway which discharges into concrete box culvert 6.1 feet high x 5.2 feet wide. Crest elevation can vary from 92.0 feet to 99.0 feet, which is crest of emergency spillway |
| (4) Control Mechanism | Stop logs in inlet structure |

SECTION 2 ENGINEERING DATA

2.1 Design.

No design information for the original dam is available.

For the 1969 reconstruction of Miles Pond Dam there was no design stability analysis performed for the dam and appurtenances. However, original design drawings, preliminary design hydrologic information and an executed copy of the contract and specifications are available for the 1969 reconstruction of Miles Pond Dam and are on file at DuBois & King, Inc., Randolph, Vermont 05060. (See Appendix B)

2.2 Construction Data.

No information is available concerning the original construction of the dam. No as-built plans are available for the 1969 reconstruction project of Miles Pond Dam. However, a significant amount of information concerning the 1969 reconstruction is available, such as, weekly inspection reports, miscellaneous design notes, construction photographs, reports on concrete aggregates, tests results of concrete poured, and miscellaneous survey notes for the construction site.

2.3 Operation.

No operating manual exists for Miles Pond Dam. Rules and regulations governing the water surface elevations of Miles Pond are implemented by the State of Vermont, Department of Water Resources. (See Appendix B) These regulations state that the water surface elevation shall be maintained at 98.5, assumed datum, except during the period October 15 to May 15 when the winter level of 1.5 to 2 feet below the established level is authorized.

2.4 Evaluation

a. Availability. While no information is available on the design of the original Miles Pond Dam, a significant amount of information is available concerning the 1969 reconstruction. For the 1969 reconstruction of Miles Pond Dam, information such as weekly inspection reports, miscellaneous design notes, and a set of executed contracts, plans and specifications are available from the State of Vermont Department of Water Resources, State Office Building, Montpelier, Vermont 05062. This agency also has in its files, copies of inspection reports. (See Appendix B). Weekly inspection reports, miscellaneous design notes, a set of executed contracts and specifications and the original design plans of the 1969 reconstruction of Miles Pond Dam are also on file at DuBois & King, Inc., Randolph, Vermont 05060.

b. Adequacy. The lack of actual as-built drawings and engineering data did not allow for definitive review. Technical data pertaining to the construction of the dam such as, type of materials used, and soils gradation and compaction were recorded randomly, due to the fact that full-time resident inspection was not provided. Consequently, emphasis was placed upon the findings of the visual inspection and sound engineering judgment.

c. Validity. The original design drawings concerning the reconstruction of the dam in 1969 do not appear to be completely accurate. Changes such as alignment of the left concrete abutment and small discrepancies in elevations are evident. These changes probably occurred during construction.

SECTION 3 VISUAL INSPECTION

3.1 Findings

a. General. The field inspection of Miles Pond Dam was performed on September 30, 1980. The weather was overcast and cool with temperature near 60°F. The inspection team included personnel from DuBois & King, Inc., Geotechnical Engineers, Inc., and Knight Consulting Engineers, Inc. A copy of the inspection checklist as completed during the field inspection is included as Appendix A. At the time of the inspection, the water surface elevation was at 98.5.

b. Dam. The dam is an earth embankment with the outlet structure located in the center of the dam (Photo 1). The embankment section between the principal spillway (stop log chute spillway) and the left abutment is mostly covered with grass which has been kept mowed. However, there is an unpaved sand-and-gravel road that crosses the crest close to the abutment and there are a few small bare spots elsewhere on the crest (Photo 2). The crest itself is slightly irregular but there is no evidence of sloughing on either the upstream or downstream slopes. There is minor erosion on the downstream slope.

The embankment section between the right end of the emergency spillway and the right abutment is mostly covered with grass which has been kept mowed. However, there is a rock outcrop with a few trees, located on the downstream slope, approximately 35 feet to the right of the right side of the emergency spillway (Photo 3). The crest itself is slightly irregular but there is no evidence of sloughing on either the upstream or downstream slopes. The right abutment appears to be in good condition.

The central section of the dam is the outlet structure. The central section of the dam consists of a principal and an emergency spillway. The emergency overflow spillway appears to be an earthen embankment paved with granite blocks on the downstream slope (Photo 4). The joints between the granite blocks have been slush-grouted. This grout has broken out of a few joints (Photo 5). There is a concrete wall at the crest of the dam, apparently a cutoff wall, extending the entire length of the emergency spillway from the stop log chute spillway structure to the right abutment. The slush-grouted granite blocks have slid down the slope leaving an approximately one-half inch crack between the concrete cutoff wall and the granite blocks (Photo 6). At the toe of the dam, there is a granite-block paved channel to carry minor overflows to the left side of the toe where they would discharge into the principal spillway between the stop log spillway entrance and the spillway culvert, which discharges about 280 feet downstream from the toe of the dam. There is a horizontal granite-block-paved apron extending about 10 feet downstream from the toe of the dam, and beyond that is a grassed waterway (which is kept mowed) extending about 280 feet downstream (Photo 7), to the outlet channel. No evidence of seepage from either the foundation or the abutments was observed.

c. Appurtenant Structures. The principal spillway consists of a stop log structure, a chute spillway and concrete box culvert. The stop log structure (Photo 8) provides the entrance into the chute spillway (Photo 8) which discharges into the concrete box culvert, 6.1 by 5.2 feet (Photo 9). The condition of the concrete and stop logs of the principal spillway is good. The stop logs have straight cut edges. The discharge outlet of the principal spillway is a 280 foot long concrete box culvert. The discharge end of the spillway culvert has undergone considerable concrete erosion near the invert level (Photos 10 & 11).

The emergency spillway consists of a 12 inch wide concrete sill, 90 feet in length, a basin paved with grouted granite blocks and a grassed waterway (Photo 4). The emergency spillway is in good condition except for the areas of the grouted granite blocks, where the grouted joints have broken or cracked (Photos 5 & 6).

d. Reservoir. Miles Pond is a natural lake which has had its water surface elevation raised by the Miles Pond Dam. The maximum depth of the lake is 55 feet. While the natural lake level is not known, a depth chart prepared by Vermont Department of Water Resources (Appendix B) indicates that the natural control is approximately 6 feet below the current normal elevation. The shoreline of the reservoir is very well maintained in the vicinity of the dam (Photos 12 & 13). A problem may occur when fallen trees or limbs from the upstream end of Miles Pond float down to the outlet and decrease its discharge capacity during periods of high water.

e. Downstream Channel. There are large boulders and some concrete rubble on the banks of downstream channel close to the discharge end of the culvert. Brush overhangs the channel downstream from the spillway culvert (Photo 14). The area downstream of the spillway culvert does not present a problem due to the extremely flat overbanks, and general swampy downstream conditions.

3.2 Evaluation

On the basis of the visual inspection, the dam is judged to be in good condition. Factors that can endanger the future condition of the dam are the following:

a. The unpaved roadway which crosses the embankment and a few spots bare of vegetation of the embankment near the left abutment would be susceptible to erosion if the dam were overtopped.

b. The slush grout between the granite blocks which pave the downstream slope of the emergency spillway is missing in some places. This grout was apparently placed after erosion of the soil under the granite blocks during earlier flows over the spillway. It is not possible to determine on the basis of the visual inspection above whether the grouting serves as essential purpose in preventing erosion of the granite block paving and underlying soils, or whether it might (if completely intact) result in water pressure building up under the paving which might endanger the spillway.

c. The concrete erosion at the discharge end of the spillway culvert could result in the collapse and blockage of the culvert.

SECTION 4 OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

a. General. Miles Pond Dam creates an impoundment of water which is primarily used for recreation. During the summer months the water level is maintained at 98.5 feet to facilitate recreational benefits at Miles Pond. The lake level is lowered 1.5 to 2 feet during the period of October 15 to May 15, as a precautionary measure against winter and spring flooding. The lake level is controlled by regulating the number of stop logs installed in the stop log chute spillway (principal spillway).

b. Warning System. There is no formal warning system to alert downstream residents in case of an emergency at the dam.

4.2 Maintenance Procedures

a. General. There is a program for maintaining the dam. The Vermont Department of Water Resources does maintain the embankments and clears the spillways at least two times a year during pool level adjustments.

b. Operational Facilities. The stop logs are the only parts which require operation. The biannual operation of the upper portions of the stop logs is sufficient to keep them in good working condition. The lower sections are not normally removed.

4.3 Evaluation

The present maintenance to date has been sufficient but additional inspection will be required in the future to insure the security of the structure.

The spillways and the stop logs should be inspected on a regular basis and implement replacement or repairs as needed.

The owner should establish written procedures for operating and maintaining the structure. Written procedures should also be established for a formal warning system in case of an emergency.

SECTION 5 EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

Miles Pond Dam is an earth embankment with a length of approximately 400 feet and a structural height of 19 feet. The appurtenant works consist of two spillways; a principal spillway and an emergency spillway. The principal spillway consist of a stop log chute spillway (net weir length 8.7 feet), which discharges into concrete box culvert, 6.1 feet high x 5.2 feet wide. At the end of the stop log chute spillway there is an adverse slope which acts as an energy dissipator before the discharge enters the concrete box culvert. The chute spillway is regulated by two stop log openings. The spillway has an ungated elevation of 92.0 feet, with a normal operation elevation of 98.5 feet. The emergency spillway consists of a 12 inch wide concrete sill, 90 feet long, which discharges into a basin lined with grouted granite blocks. At the toe of the dam (bottom of basin), there is a granite-block-paved channel to carry minor overflows to the left side of the toe where they could discharge into the principal spillway between the stop log spillway entrance and the spillway culvert. If the spillway culvert should become plugged the discharge would then use the grass waterway below the principal and emergency spillways to reach the outlet channel. The crest of the emergency spillway is 99.0 feet. With the water level at the top of dam (102.4 feet), the stop log chute spillway at the normal operating elevation (98.5 feet) would convey 240 cfs and the emergency spillway could convey 1,920 cfs. Thus, the project would discharge 2,160 cfs at the top of dam, elevation 102.4. At the top of dam (102.4) the stop log chute spillway at the unregulated elevation of 92.0 feet would convey 990 cfs and the emergency spillway would convey 1,920 cfs. Thus, the project would discharge 2,910 cfs at the top of dam at the stop log chute spillway unregulated elevation of 92.0 feet. The 6.7 square mile watershed is primarily mountainous terrain and is predominantly forested with very little development. Development in the watershed is limited to the immediate lake shore area.

5.2 Design Data

The only hydrologic design information available for Miles Pond Dam is preliminary information obtained from DuBois & King, Inc. A copy of the preliminary data is included in Appendix B. The preliminary hydrologic data was not modified for the final spillway design changes, therefore, the values were not used.

5.3 Experience Data

There are no recorded experience of overtopping or any visual accounts of such.

5.4 Test Flood Analysis

The size of this structure puts it in the Intermediate class. It has storage of greater than 1,000 and less than 50,000 acre-feet. The hazard potential classification was determined to be High because the failure of

Miles Pond Dam is likely to endanger more than a few lives in three to five dwellings along Miles Pond Brook in East Concord. In accordance with the "Recommended Guidelines for Safety Inspection of Dams", the test flood is the full probable maximum flood (PMF). The full PMF discharge of 12,035 cfs was calculated using HEC-1, (Hydrologic Engineering Center - Flood Hydrograph Package). The routing of the full PMF thru Miles Pond Dam was accomplished by using the Modified Puls method in the HEC-1 computer program. The assumption was made that the pond would be at pool level elevation 98.5 feet (normal summer pool elevation) prior to beginning of test flood. During the test flood, the structure will be overtopped by 3.4 feet (elevation 105.8) which is a maximum pool storage 2,970 acre-feet. The outflow would be 11,273 cfs. This represents a 6 percent reduction of the test flood inflow. The two spillways can pass 2,160 cfs at the top of dam (elevation 102.4) or 19 percent of the test flood outflow. The $\frac{1}{2}$ PMF flood of 6,020 cfs would have an outflow of 5,150 cfs or a reduction of the inflow by 14 percent and would overtop the crest of the dam by 1.3 feet (elevation 103.7)

5.5 Dam Failure Analysis

Using the Corps of Engineers, April 1978, "Rules of Thumb Guidance for Estimating Downstream Dam Failure Hydrographs", a dam failure analysis was performed for Miles Pond Dam. Prior to failure, the water level was assumed to be at the top of the dam (elevation 102.4). The breach height of 10.4 feet and breach width of 163 feet (40 per cent of the dam length) were used to compute the breach discharge of 9,190 cfs. Prior to failure with the water level at the top of dam the two spillways would be discharging 2,160 cfs.

The breach would produce a 10.4 foot depth with a discharge of 11,350 cfs immediately downstream of the dam. Approximately three miles downstream of Miles Pond Dam in the settlement of East Concord the flood wave would be at a stage of 9 to 11 feet above the streambed at a discharge of 8,400 cfs. Appreciable damage could occur in the areas of East Concord where 3 to 5 housing units are 6 to 8 feet above the streambed. The stage prior to the dam failure would be 7 feet in the settlement of East Concord. This increase in the flood wave height is due to the channel configuration. The flood wave would have the potential for washing out several bridges; two railroad bridges and two town highway bridges in East Concord. The flood wave would cause appreciable damage and possible loss of life in three to five dwellings with the flood levels up to 2 to 4 feet above the first floor of these dwellings. It is probable that other housing units located in the fringe areas of the valley and others located downstream would suffer lesser damage from the resultant flood. Because of the possibility of the loss of more than a few lives, the dam is classified as High hazard. (Refer to Appendix D - Possible Flood Damage Area Map)

SECTION 6 EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

The visual inspection did not disclose significant indication of overall instability. However, there are three potential structural problems observed during the field inspection. One of the problems was the lack of erosion protection at the unpaved roadway which crosses the crest of the embankment near the left abutment and on a few bare spots on the crest of the embankment. The second problem is the grouted granite-block basin in the emergency spillway. The slush - grout between the granite blocks which pave the downstream slope of the emergency spillway is missing in some places. This grout was apparently placed after erosion of the soil under the granite blocks during earlier flows over the spillway. It is not possible to determine on the basis of the visual inspection above whether the grouting serves an essential purpose in preventing erosion of the granite - block paving and underlying soils, or whether it might (if completely intact) result in water pressure building up under the paving which might endanger the spillway. The third problem observed during the field inspection was the concrete erosion at the discharge end of the spillway culvert, this erosion would cause the collapse and blockage of the culvert.

6.2 Design and Construction Data

No design data was available for the original dam construction.

6.3 Post Construction Data

In 1969, under the direction of the State of Vermont Department of Water Resources, DuBois & King, Inc., of Randolph, Vermont, redesigned the Miles Pond outlet structure. At the time of reconstruction, there was no structural stability analysis performed on the outlet structure or earth embankments. Although the original design drawings concerning the 1969 reconstruction are available, the drawings do not appear to be completely accurate. Changes such as alignment of the left concrete abutment and small discrepancies in elevations are evident. These changes probably occurred during construction. For these reasons a structural stability analysis was not performed using the design drawings configurations. The structural stability analysis was completely based on the visual inspection of the dam.

6.4 Seismic Stability

This dam is located in Seismic Zone 2 and, in accordance with the Phase I Guidelines, does not warrant seismic analysis.

SECTION 7
ASSESSMENT, RECOMMENDATIONS, AND REMEDIAL MEASURES

7.1 Assessment

a. Condition. On the basis of the visual inspection, the dam is in good condition. However, due to the hydraulic inadequacy of the emergency spillway the overall condition is judged to be fair.

b. Adequacy of Information. There is a significant amount of design information available concerning the 1969 reconstruction, but as explained in Section 2.4(c) the accuracy of the original design drawings is questionable. The information on the actual 1969 reconstruction as explained in Section 2.4(b) was recorded randomly due to the fact that full-time resident inspection was not provided. Consequently, emphasis was placed upon the findings of the visual inspection and sound engineering judgment.

c. Urgency. The recommendations presented in Section 7.2 and 7.3 should be carried out within one year of receipt of this report by the owner.

7.2 Recommendations

The following investigations and needed corrections should be performed under the direction of a registered engineer qualified in the design and construction of dams.

- (1) Design adequate erosion protection for the embankment section of the dam;
- (2) Investigate the granite - block paving of the emergency spillway (including the slush grout between the blocks and the underlying soils) and design remedial measures if needed;
- (3) Repair concrete erosion on the discharge end of the spillway culvert; and
- (4) Perform a detailed hydrologic - hydraulic investigation to assess further the potential of overtopping the dam and the need for the means to increase project discharge capacity.

7.3 Remedial Measures

a. Operation and Maintenance Procedures

- (1) A professional engineer qualified in the design and construction of dams should make a comprehensive technical inspection of the dam once every year and implement maintenance recommendations.

- (2) Establish a surveillance program for use during and immediately after heavy rainfall and also a downstream warning program to follow in case of an emergency.

7.4 Alternatives

There are no practical alternatives consistent with the present use of the dam.

APPENDIX A
VISUAL CHECKLIST WITH COMMENTS

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT Miles Pond Dam, Concord, Vermont

DATE Sept. 30, 1980

TIME 10:00

WEATHER Overcast

W.S. ELEV. _____ U.S. _____ DN.S. _____

PARTY:

- | | |
|--------------------------------------|-----------|
| 1. <u>Robert Wernecke, D&K</u> | 6. _____ |
| 2. <u>Charles J. Kissel, D&K</u> | 7. _____ |
| 3. <u>Stephen Knight, KCE</u> | 8. _____ |
| 4. <u>Ronald Hirschfeld</u> | 9. _____ |
| 5. _____ | 10. _____ |

| PROJECT FEATURE | INSPECTED BY | REMARKS |
|-------------------------------|---|---------|
| 1. <u>Geotechnical</u> | <u>Ronald Hirschfeld</u> | |
| 2. <u>Structural</u> | <u>Stephen Knight</u> | |
| 3. <u>Hydraulic/Hydrology</u> | <u>Robert Wernecke & Charles Kissel</u> | |
| 4. _____ | _____ | _____ |
| 5. _____ | _____ | _____ |
| 6. _____ | _____ | _____ |
| 7. _____ | _____ | _____ |
| 8. _____ | _____ | _____ |
| 9. _____ | _____ | _____ |
| 10. _____ | _____ | _____ |

NOTE: All elevations are based on an assumed elevation of 102.5, taken from the left corner of the concrete cutoff wall.

INSPECTION CHECKLIST

PROJECT Miles Pond Dam, VT

DATE Sept. 30, 1980

PROJECT FEATURE _____

NAME Robert Wernecke

DISCIPLINE _____

NAME Ronald Hirschfeld

NAME Stephen Knight

| AREA EVALUATED | CONDITIONS |
|---|----------------------------------|
| <u>DAM EMBANKMENT</u> | |
| Crest Elevation | 102.4 Feet |
| Current Pool Elevation | 98.5 Feet |
| Maximum Impoundment to Date | Unknown |
| Surface Cracks | None observed |
| Pavement Condition | No pavement |
| Movement or Settlement of Crest | None observed |
| Lateral Movement | None observed |
| Vertical Alignment | Very slightly irregular |
| Horizontal Alignment | Good |
| Condition at Abutment and at Concrete Structures | Good |
| Indications of Movement of Structural Items on Slopes | No structures on slopes |
| Trespassing on Slopes | Slight evidence of trespassing |
| Sloughing or Erosion of Slopes or Abutments | Slight erosion at downstream toe |
| Rock Slope Protection - Riprap Failures | No riprap |
| Unusual Movement or Cracking at or Near Toe | None observed |
| Unusual Embankment or Downstream Seepage | None observed |
| Piping or Boils | None observed |

INSPECTION CHECKLIST

PROJECT Miles Pond Dam, VT

DATE Sept. 30, 1980

PROJECT FEATURE _____

NAME Robert Wernecke

DISCIPLINE _____

NAME Ronald Hirschfeld

NAME Stephen Knight

| AREA EVALUATED | CONDITIONS |
|-----------------------------------|---------------|
| <u>DAM EMBANKMENT</u> (Continued) | |
| Foundation Drainage Features | None observed |
| Toe Drains | None observed |
| Instrumentation System | None observed |
| Vegetation | Grass |

INSPECTION CHECKLIST

PROJECT Miles Pond Dam, VT

DATE Sept. 30, 1980

PROJECT FEATURE _____

NAME Robert Wernecke

DISCIPLINE _____

NAME Ronald Hirschfeld

NAME Stephen Knight

| AREA EVALUATED | CONDITIONS |
|----------------|------------|
|----------------|------------|

DIKE EMBANKMENT

N/A

Crest Elevation

Current Pool Elevation

Maximum Impoundment to Date

Surface Cracks

Pavement Condition

Movement or Settlement of Crest

Lateral Movement

Vertical Alignment

Horizontal Alignment

Condition at Abutment and at Concrete Structures

Indications of Movement of Structural Items on Slopes

Trespassing on Slopes

Sloughing or Erosion of Slopes or Abutments

Rock Slope Protection - Riprap Failures

Unusual Movement or Cracking at or Near Toes

Unusual Embankment or Downstream Seepage

Piping or Boils

INSPECTION CHECKLIST

PROJECT Miles Pond Dam, VT

DATE Sept. 30, 1980

PROJECT FEATURE _____

NAME Robert Wernecke

DISCIPLINE _____

NAME Ronald Hirschfeld

NAME Stephen Knight

| AREA EVALUATED | CONDITIONS |
|----------------|------------|
|----------------|------------|

OUTLET WORKS - CONTROL TOWER

N/A

a. Concrete and Structural

General Condition

Condition of Joints

Spalling

Visible Reinforcing

Rusting or Staining of Concrete

Any Seepage or Efflorescence

Joint Alignment

Unusual Seepage or Leaks in Gate Chamber

Cracks

Rusting or Corrosion of Steel

b. Mechanical and Electrical

Air Vents

Float Wells

Crane Hoist

Elevator

Hydraulic System

Service Gates

Emergency Gates

INSPECTION CHECKLIST

PROJECT Miles Pond Dam, VT

DATE Sept. 30, 1980

PROJECT FEATURE _____

NAME Robert Wernecke

DISCIPLINE _____

NAME Ronald Hirschfeld

NAME Stephen Knight

| AREA EVALUATED | CONDITIONS |
|---|---|
| <u>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u> | <u>PRINCIPAL SPILLWAY (Stop log chute spillway)</u> |
| a. Approach Channel | N/A |
| Slope Conditions | Good |
| Bottom Conditions | Good |
| Rock Slides or Falls | None |
| Log Boom | None |
| Debris | None |
| Condition of Concrete Lining | Not Applicable |
| Drains or Weepholes | Not Applicable |
| b. Intake Structure | |
| Condition of Concrete | Good |
| Stop Logs and Slots | Good condition |

INSPECTION CHECKLIST

PROJECT Miles Pond Dam, VTDATE Sept. 30, 1980

PROJECT FEATURE _____

NAME Robert Wernecke

DISCIPLINE _____

NAME Ronald HirschfeldNAME Stephen Knight

| AREA EVALUATED | CONDITIONS |
|---|--|
| <u>OUTLET WORKS - UPSTREAM END OF CONDUIT</u> | Also see Outlet Structure and Outlet Channel |
| General Condition of Concrete | Good except for erosion at base of stop log support |
| Rust or Staining on Concrete | Slight rust under fence |
| Spalling | Negligible |
| Erosion or Cavitation | None at this end |
| Cracking | Few small shrinkage cracks |
| Alignment of Monoliths | No monoliths |
| Alignment of Joints | Good |
| Numbering of Monoliths | N/A |
| Weepholes | Weephole at base of training wall on each side of spillway chute discharging minor amount of water, with rust staining of concrete below weephole. |

INSPECTION CHECKLIST

PROJECT Miles Pond Dam, VT

DATE Sept. 30, 1980

PROJECT FEATURE _____

NAME Robert Wernecke

DISCIPLINE _____

NAME Ronald Hirschfeld

NAME Stephen Knight

| AREA EVALUATED | CONDITIONS |
|--|---|
| <u>OUTLET WORKS - DOWNSTREAM END OF</u> <u>OUTLET CONDUIT</u> | |
| General Condition of Concrete | Poor |
| Rust or Staining | Slight staining (No rust) |
| Spalling | Moderate |
| Erosion or Cavitation | Severe, at invert of discharge end of concrete box culvert (erosion occurs for approximately 5 feet at the invert) |
| Visible Reinforcing | None except rebar left exposed at outlet end of conduit |
| Any Seepage or Efflorescence | No |
| Condition at Joints | Not observable |
| Drain Holes | Not applicable |
| Channel | |
| Loose Rock or Trees Overhanging Channel | Large bushes overhanging channel, large boulders and concrete rubble on banks of channel near conduit |
| Condition of Discharge Channel | Fair |

INSPECTION CHECKLIST

PROJECT Miles Pond Dam, VT DATE Sept. 30, 1980-
 PROJECT FEATURE _____ NAME Robert Wernecke
 DISCIPLINE _____ NAME Ronald Hirschfeld
 NAME Stephen Knight

| AREA EVALUATED | CONDITIONS |
|--|--|
| <u>OUTLET WORKS - EMERGENCY SPILLWAY</u> <u>WEIR, APPROACH AND DISCHARGE</u> <u>CHANNELS</u> | <u>EMERGENCY SPILLWAY</u> |
| a. Approach Channel | |
| General Condition | Good |
| Loose Rock Overhanging Channel | None |
| Trees Overhanging Channel | None near spillway |
| Floor of Approach Channel | Sediment to within 1-2 ft of crest on upstream side of weir |
| b. Weir and Training Walls | |
| General Condition of Concrete | Good |
| Rust or Staining | No rust, very slight staining |
| Spalling | Negligible |
| Any Visible Reinforcing | None |
| Any Seepage or Efflorescence | None |
| Drain Holes | None observed |
| c. Discharge Channel | |
| General Condition | Fair |
| Loose Rock Overhanging Channel | None |
| Trees Overhanging Channel | None |
| Floor of Channel | Cut-granite-blocks with slush mortar in joints |

INSPECTION CHECKLIST

PROJECT Miles Pond Dam, VT

DATE Sept. 30, 1980

PROJECT FEATURE _____

NAME Robert Wernecke

DISCIPLINE _____

NAME Ronald Hirschfeld

NAME Stephen Knight

| AREA EVALUATED | CONDITIONS |
|----------------|------------|
|----------------|------------|

OUTLET WORKS - EMERGENCY SPILLWAY
WEIR, APPROACH AND DISCHARGE
CHANNELS (Continued)

EMERGENCY SPILLWAY

Other Obstructions

None

Other Comments

Low discharges are controlled
and diverted by small channel
in emergency spillway into
principal spillway

INSPECTION CHECKLIST

PROJECT Miles Pond Dam, VT

DATE Sept. 30, 1980

PROJECT FEATURE _____

NAME Robert Wernecke

DISCIPLINE _____

NAME Ronald Hirschfeld

NAME Stephen Knight

| AREA EVALUATED | CONDITIONS |
|----------------|------------|
|----------------|------------|

OUTLET WORKS - SERVICE BRIDGE

N/A

a. Super Structure

Bearings

Anchor Bolts

Bridge Seat

Longitudinal Members

Underside of Deck

Secondary Bracing

Deck

Drainage System

Railings

Expansion Joints

Paint

b. Abutment & Piers

General Condition of Concrete

Alignment of Abutment

Approach to Bridge

Condition of Seat & Backwall

APPENDIX B
ENGINEERING DATA

APPENDIX B
ENGINEERING DATA

1. Design and Construction Records

A. Records of 1969 Construction

A.1 Executed copy of Contract & Specs.

A.2 Weekly Inspection Report

A.3 Miscellaneous Construction Photographs

Information from

DuBois & King, Inc.

Randolph, Vermont 05060

2. Past Inspection Reports

A. Inspection Report

B. Other Inspection Reports

Appendix B, pgs. B-2

Department of Water

Resources

State of Vermont

State Office Building

Montpelier, Vermont 05062

3. Miscellaneous Data

A. Preliminary Design Notes

B. Rules & Regulations on Water Surface Levels

C. Photographs of Dam Failure September 1970

D. Miles Pond Depth Chart

Appendix B

pgs. B-3 to B-10

Appendix B

pgs. B-11 to B-12

Appendix B

pgs. B-13 to B-15

4. Plans

A. Original Design Drawings

B. Site Plan

C. Photo Location Map

Figures 1-4

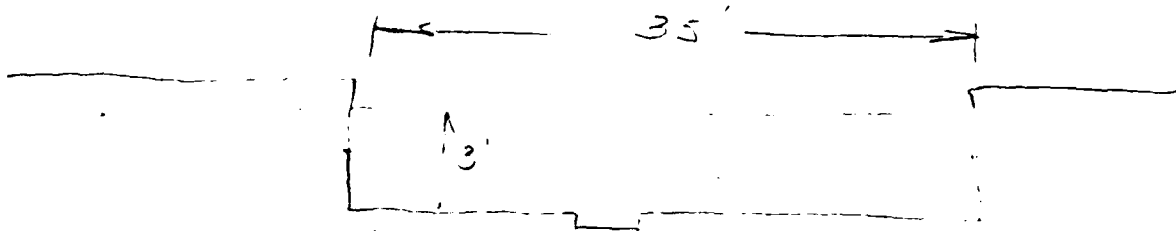
Figure B-1

Figure B-2

Inspection Report not available
at time of collation.

DUBOIS & KING · Consulting Engineers

Job No. 3519 · Randolph, Vermont Sheet 1 of 2
 Project Highway 100 Date 11/10
 Subject Drainage By DK
 Ch'k. by



$$Q = 3.0 \text{ ft}^3/\text{s}$$

$$\frac{E}{H} = \frac{25'}{3'} \quad H^{3/2} = 127 = 5.2$$

$$Q = 3.0 \text{ ft}^3/\text{s} (5.2) = 547 \text{ cfs.}$$

$$\text{Run-off} \quad C = 0.5 \text{ ft}^3/\text{s} = 334 \text{ cfs.}$$

$$25 \text{ year Freq.} \quad L = 4.5 \quad \text{Duration} = 5 \text{ min.}$$

$$C = 0.16 \quad \text{Rating (Knots)}$$

$$Q = 0.16 (4.5) (334) = 239 \text{ cfs.}$$

$$\text{Vol of Holes Pond 1152 ft}^3 \text{ } \times \text{ } 10 \text{ ft} = 3.0'$$

$$3.0' \times 7000 \times 1000 = 21,000,000 \text{ cu ft}$$

$$\text{Ponding Time (min)} \frac{21,000,000}{2940 \times 6.0} = \frac{2100}{17.6} = 119 \text{ min}$$

$$\pm 2 \text{ hrs.}$$

$$\text{Extreme condition. Sat. ground } C = 1.0 \quad L = 4.5$$

$$334 \times 4.5 = 15,200 \text{ cfs.} \quad - \frac{15 \text{ min}}{12/10 \text{ on flow}} -$$

DUBOIS & KING · Consulting Engineers

Job No. 5515 · Randolph, Vermont Sheet 1 of 1
 Project Highway 100 Drainage Date April
 Subject Flow Rate Study By ---
Small Dam - 100 ft Chk. by ---

ASSUMPTION "B" - PROBLEM DAMAGE NEC. NO LOSS OF LIFE (NE S.)
 SIZE OF DRAINAGE AREA - 6 sq mi

ZONE I 6 hr - 10 sq mi Prob max. precip. 19 inches

| DURATION hrs. | % OF 3 hr - 10 sq mi. | TOTAL RAIN INCHES |
|------------------|--------------------------|----------------------|
| 0-6 | 100 | 19 |
| 0-12 | 110 | 20.9 |
| 0-24 | 120 | 22.8 |
| 0-48 | 127 | 24.1 |

| TIME hrs. | % 6 hr rain | Accum. Rain | INCR |
|-----------|-------------|-------------|------|
| 1 | 49 | 9.3 | 9.3 |
| 2 | 64 | 12.2 | 2.9 |
| 3 | 75 | 14.2 | 2.0 |
| 4 | 84 | 16.0 | 1.8 |
| 5 | 92 | 17.5 | 1.5 |
| 6 | 100 | 19.0 | 1.5 |

DESIGN STORM 15.6 hrs IN SEQUENCE 643125

| TIME IN HRS. | INCR RAIN INCHES | Accum. | RED. FACT. = 3.0 Acc. Reduced | INCR. RED. |
|--------------|------------------|--------|----------------------------------|------------|
| 0-1 | 1.5 | 1.5 | 0.5 | 0.5 |
| 1-2 | 1.8 | 3.3 | 1.1 | 0.6 |
| 2-3 | 2.0 | 5.3 | 1.8 | 0.7 |
| 3-4 | 9.3 | 14.6 | 4.9 | 3.1 |
| 4-5 | 2.9 | 17.5 | 5.8 | 0.9 |
| 5-6 | 1.5 | 19.0 | 6.3 | 0.5 |
| 6-12 | 1.9 | 20.9 | 6.9 | 0.3 |
| 12-24 | 1.9 | 22.8 | 7.6 | 0.7 |
| 24-48 | 1.3 | 24.1 | 8.0 | 0.4 |

HYDROLOGIC. SOIL GRP. "B" (ASSUMED.)

LAND USAGE 85% HEAVILY WOODED } RUN-OFF CURVE NO
 15% FIELD & PASTURE } SAY 56

TIME OF CONC. $T_c = \left(\frac{11.9 L^3}{H} \right)^{0.385}$

$L = 3 \text{ mi.}$
 $H = 100 \text{ ft}$

$T_c = \frac{11.9(27)}{100}^{0.385} = 1.56 \text{ hr.}$
 Say 1.6 hr.

DUBOIS & KING Consulting Engineers

Job No. 536 Randolph, Vermont Sheet 3 of 3
 Project MIST POND DAM Date Apr 1954
 Subject _____ By J
 _____ Chk. by _____

FIRST 6 hr. $D = 1$
 SECOND 6 hr. $D = 6$
 SECONDS 12 hr. $D = 12$

$$T_p = \frac{D}{2} + 0.6 T_c$$

$$T_c = 1.6 \text{ hr}$$

$$T_b = 2.67 T_p$$

$$A = 6 \text{ sq mi.}$$

$$Q_p = \frac{484 A Q}{T_p}$$

$$Q = 1.00 \text{ in.}$$

$$D = \frac{1}{3} \text{ hr} \quad T_p = \frac{1}{3} + 0.6(1.6) = 1.13$$

From 0-6 hrs.

$$T_b = 2.67(1.13) = 3.01$$

$$Q_p = \frac{484(6)(1.0)}{1.13} = 2570$$

$$D = 6 \text{ hr.} \quad T_p = \frac{6}{2} + 0.6(1.6) = 4.07$$

$$T_b = 2.67(4.07) = 10.9$$

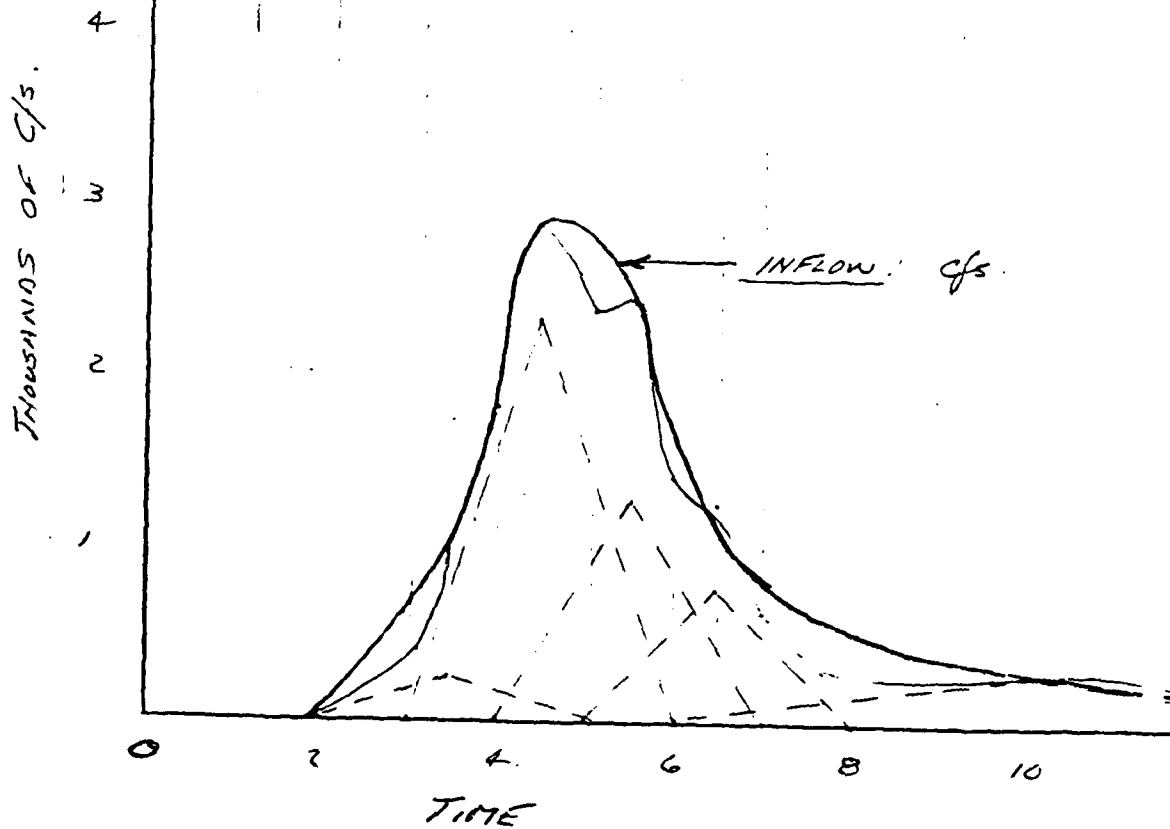
$$Q_p = \frac{484(6)(1.0)}{4.07} = 715$$

DUBOIS & KING Consulting Engineers

Job No. 6918 Randolph, Vermont Sheet 4 of 5
 Project FILES Dam - 2nd Date 1953
 Subject POND INFLOW By ---
DESIGN STORM - ASSUMPTION '13' Ch'k. by ---

(Tp for $S = 1hr$
 $= \pm 1.5$)

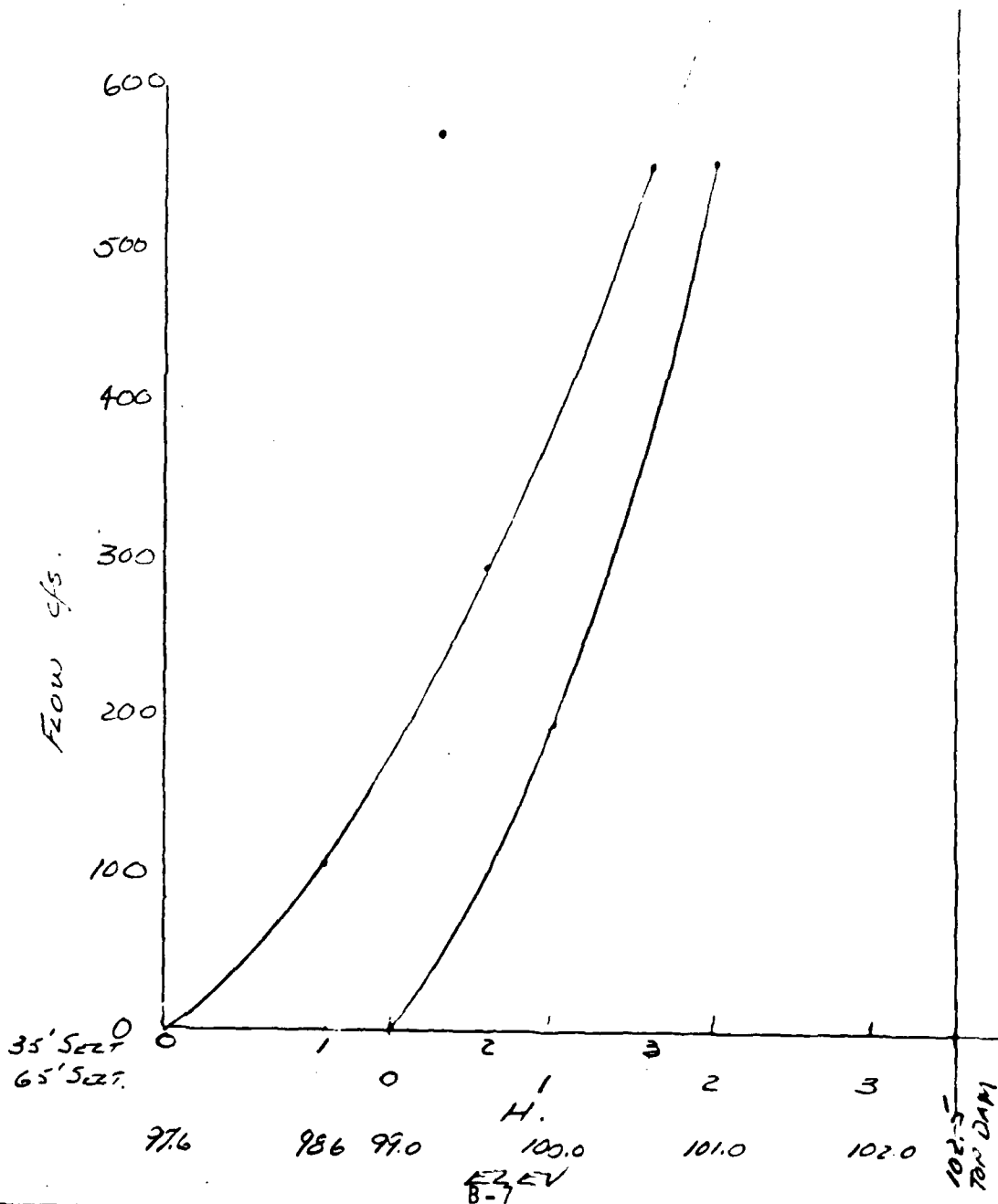
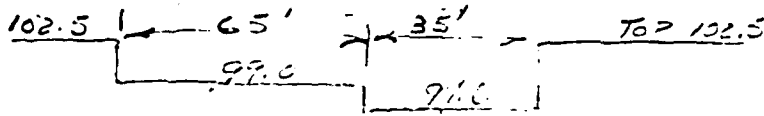
| TIME Hrs. | Incr Rain | Accum Rain | Run-off Acc. Incr. | Sp for 1.00 inch | Sp for Incr. Runoff | Incr. Hydrograph Begin time Peak time End time |
|--------------|--------------|---------------|-----------------------|---------------------|------------------------|---|
| 0-1 | 0.5 | 0.5 | 0 | 2570 | 0 | 0 0 0 |
| 1-2 | 0.6 | 1.1 | 0 | 2570 | 0 | 1 3.5 1 |
| 2-3 | 0.7 | 1.8 | 0.1 | 2570 | 257 | 2 3.5 5.0 |
| 3-4 | 3.1 | 4.9 | 1.0 | 2570 | 2310 | 3 4.5 6.0 |
| 4-5 | 0.9 | 5.8 | 1.5 | 2570 | 1285 | 4 5.5 7.0 |
| 5-6 | 0.5 | 6.3 | 1.8 | 2570 | 770 | 5 6.5 8.0 |
| 6-12 | 0.3 | 6.9 | 2.2 | 715 | 286 | 6 10.1 15.7 |



DUBOIS & KING Consulting Engineers

Job No. 1212 Randolph, Vermont Sheet 5 of 5
 Project Highway Bridge - Randolph Date April 11
 Subject _____ By T
 _____ Ch'k. by _____

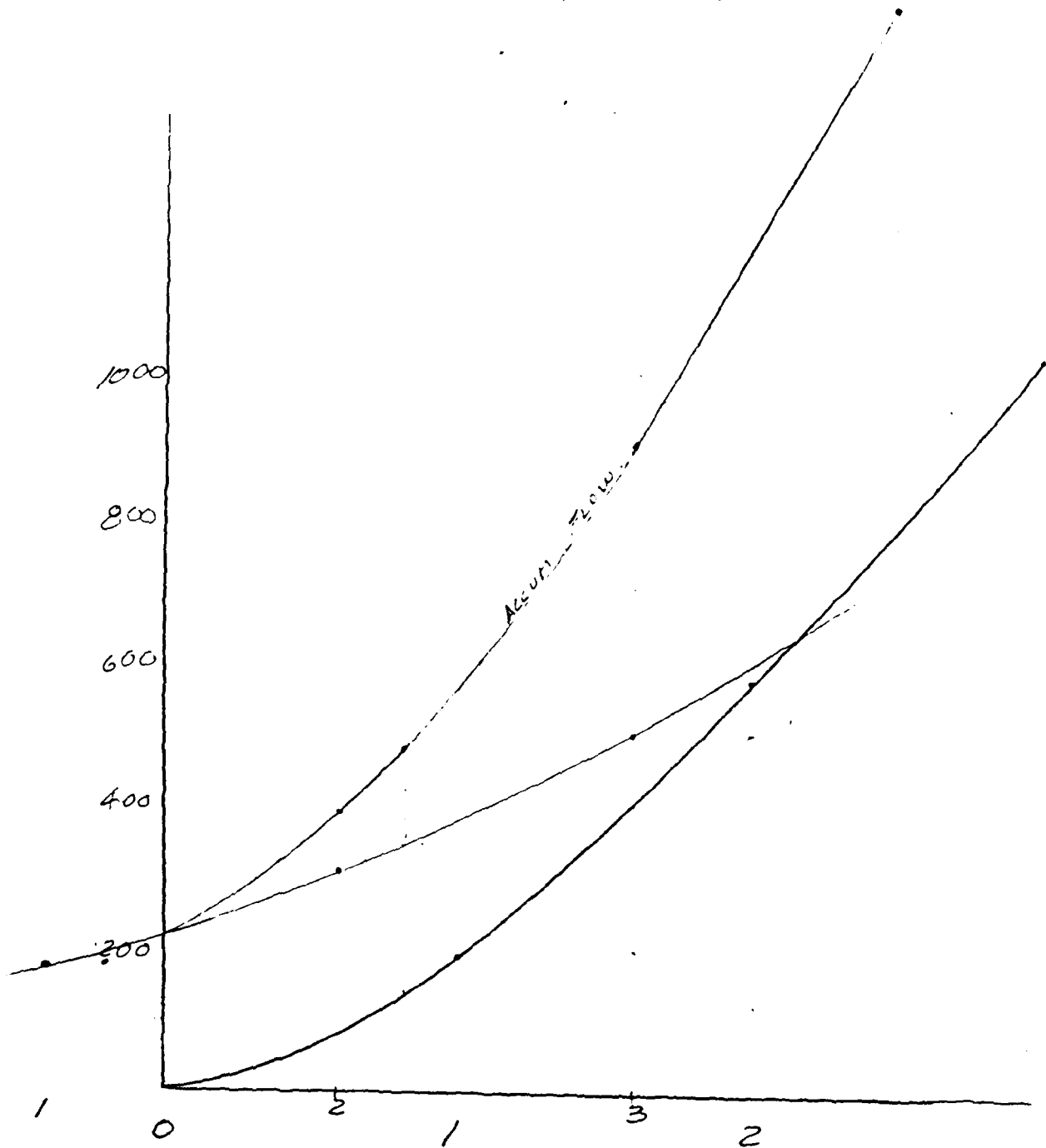
SPILLWAY CURVES



DUBOIS & KING • Consulting Engineers

Job No. 521E • Randolph, Vermont Sheet 6 of 6
Project WATER POND - FILLING Date 1915
Subject _____ By TS
Ch'k. by _____

SPILLWAY CURVES
35' SECT - 65' SECT - & ACCUM.



DUBOIS & KING · Consulting Engineers

Job No. 6575 Randolph, Vermont Sheet 7 of 7
 Project SEWERAGE - PRELIM. Date 12-2-57
 Subject _____ By _____
 _____ Chk. by _____

RISE IN POND LEVEL DURING INFLOW. 7×10^{-6} ft./ft.

| TIME | AVG. INFLOW RATE | (0.36×10^6) INFLOW C.F.T. | RISE IN FT. |
|------|------------------------|--|----------------|
| 0-1 | 0 | | |
| 1-2 | 0 | | |
| 2-3 | 500 cfs. | 1,800,000 | |
| 3-4 | 1100 cfs. | 3,960,000 | |
| 4-5 | 2800 cfs. | 10,100,000 | |
| 5-6 | 2400 cfs. | 8,636,000 | |
| 6-12 | 600 cfs. | 13,000,000 | |

| TIME | AVG INFLOW RATE | NET INFLOW RATE | INFLOW | ACUM. INFLOW | RISE | OUTFLOW RATE |
|------|-----------------------|--------------------|-----------|--------------|--------|--------------|
| 0-1 | | | | | | |
| 1-2 | | | | | | |
| 2-3 | 500 cfs. | 500 cfs. | 1,800,000 | 1,800,000 | 0.257' | 30 cfs. |
| 3-4 | 1100 cfs. | 1070 cfs. | 3,960,000 | 5,640,000 | 0.805' | 80 cfs. |
| 4-5 | 2800 cfs. | 2720 cfs. | 7,900,000 | 15,440,000 | 2.21' | 480 cfs. |
| 5-6 | 2400 cfs. | 1920 cfs. | 6,700,000 | 22,340,000 | 3.2' | 960 cfs. |
| 6-12 | 600 cfs. | -360 cfs. | | | | |

DUBOIS & KING · Consulting Engineers

Job No. _____

Randolph, Vermont

Sheet _____ of _____

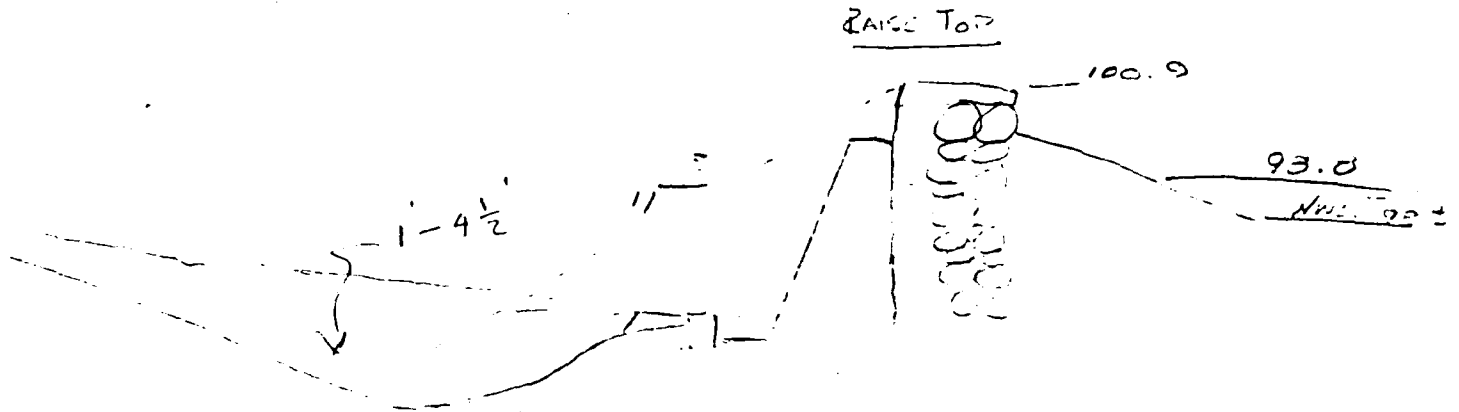
Project _____

Date _____

Subject _____

By _____

Chk. by _____



Design Area 2 Sq. mi. 6 Sq. mi. ±

Make city at high.

try removal

Underground Power line? or Blaste

Bridge?

STATE OF VERMONT
WATER RESOURCES BOARD

Establishment of Surface Water
Levels at Miles Pond in the
Town of Concord

Before the
Water Resources Board

RULES AND REGULATIONS

Proceedings having been duly held by the Vermont Water Resources Board in accordance with Title 10, V.S.A., Section 575 (a) (11), for the purpose of making and promulgating rules and regulations governing the surface water levels of Miles Pond, a natural lake constituting public water of Vermont, located in the Town of Concord, Vermont whereby, upon hearing all interested parties, preliminary findings of fact were duly issued dated February 27, 1969, and no exceptions to such preliminary findings having been filed with the said Board;

NOW THEREFORE, in consideration of all said proceedings and said preliminary findings of fact and subsequent investigations, the Vermont Water Resources Board does hereby adopt said preliminary findings No. 1 through No. 6 and the Vermont Water Resources Board does hereby make and promulgate the following rules and regulations governing the surface water levels of said Miles Pond:

1. That following the construction of the dam at the outlet of Miles Pond by the Vermont Department of Water Resources, the surface water level of Miles Pond in the Town of Concord shall be maintained at 98.50 feet, assumed datum, except during the period October 15 to May 15 when the winter level of 1-1/2 to 2 feet below the established level is authorized.
2. That provision be made during the construction of the dam at the outlet of Miles Pond by the Vermont Department of Water Resources for a satisfactory method of surface water level manipulation below the elevation of 98.50 feet, assumed datum.

3. That the temporary lowering of the surface water levels, as established herein, for maintenance, clean-up, or other purposes, shall be at a time mutually agreeable to the majority of the affected parties, and upon written direction of the Vermont Water Resources Board.

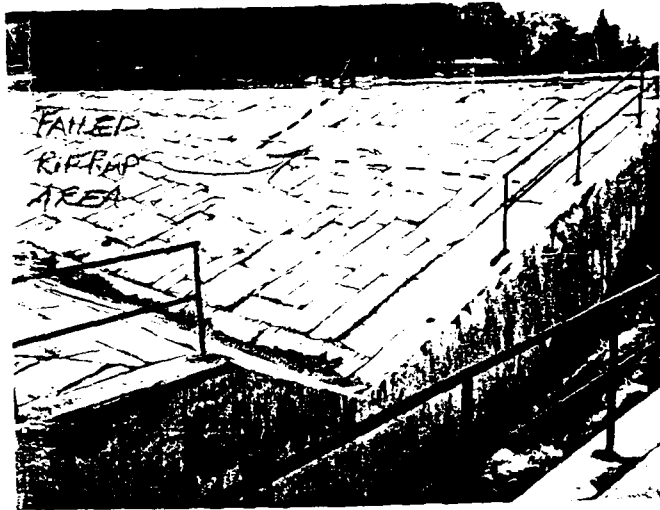
Done at Montpelier, Vermont, this 18th day of March 1969.

VERMONT WATER RESOURCES BOARD

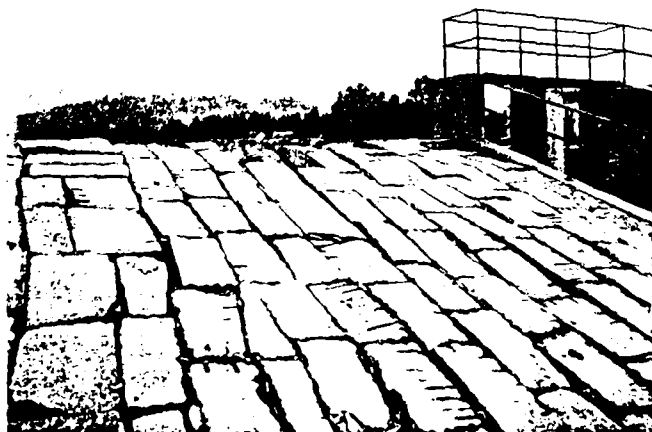
William Miller
Chairman

Martin J. Elliott
Member

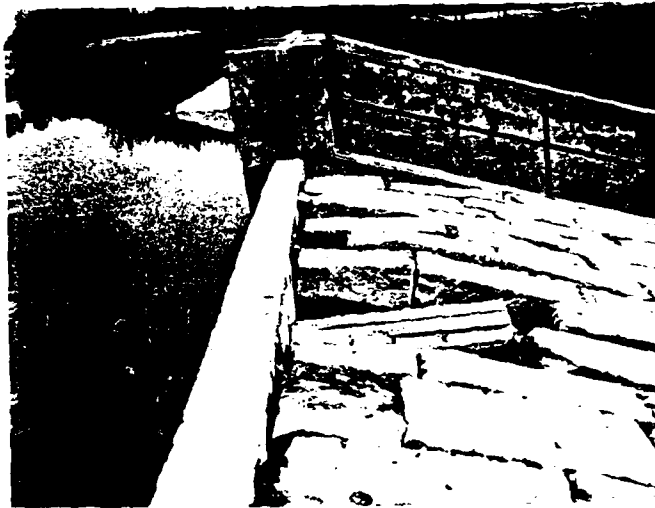
Fredrick H. Mehlman
Member



6861 MILES RD. DAM - REBAR FAILURE SEPT 30, 1970



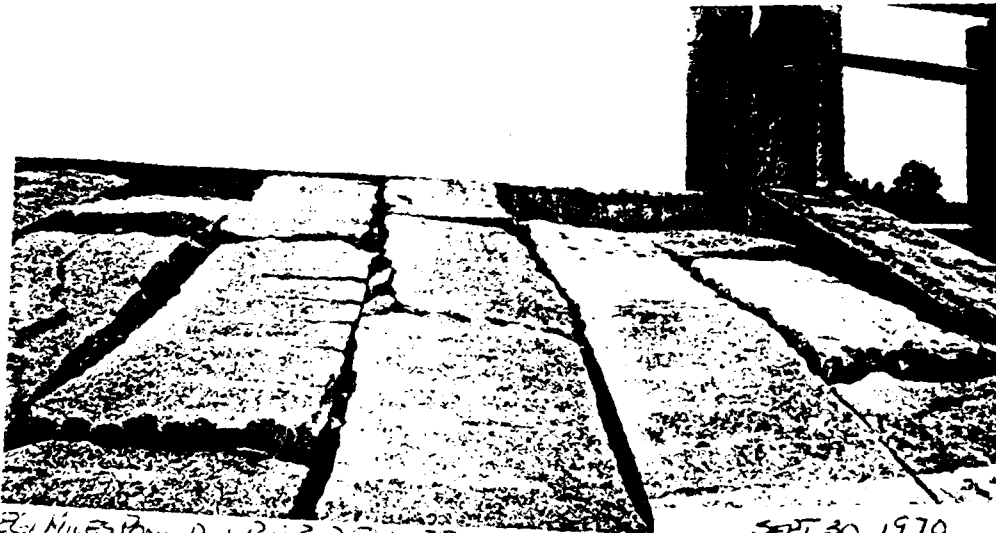
6861 MILES RD. DAM - REBAR FAILURE SEPT 30, 1970



6861 Miles Pond Dam - Riprap Failure Sept 30, 1970



6861 Miles Pond - Riprap Failure Sept 30, 1970

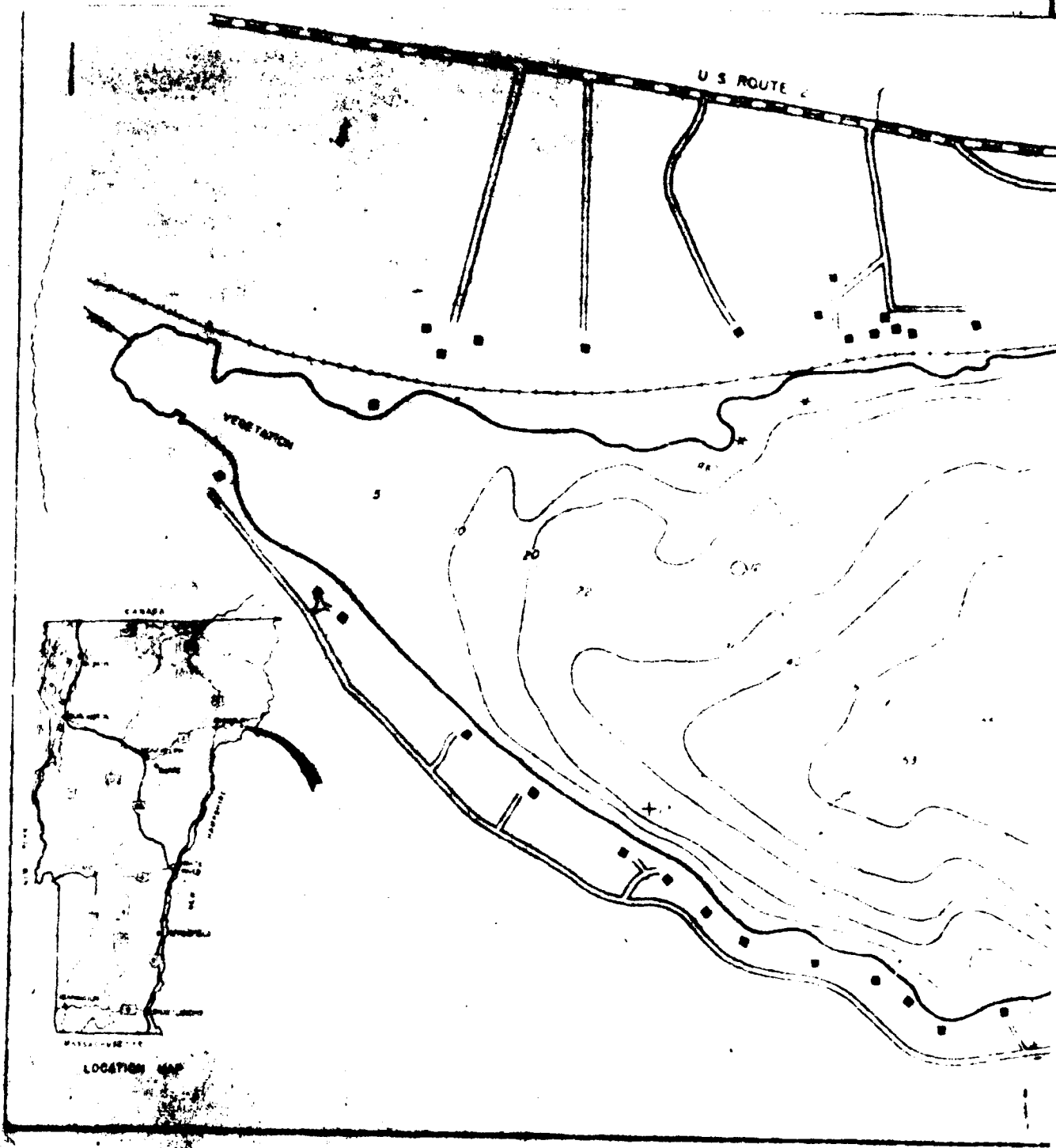


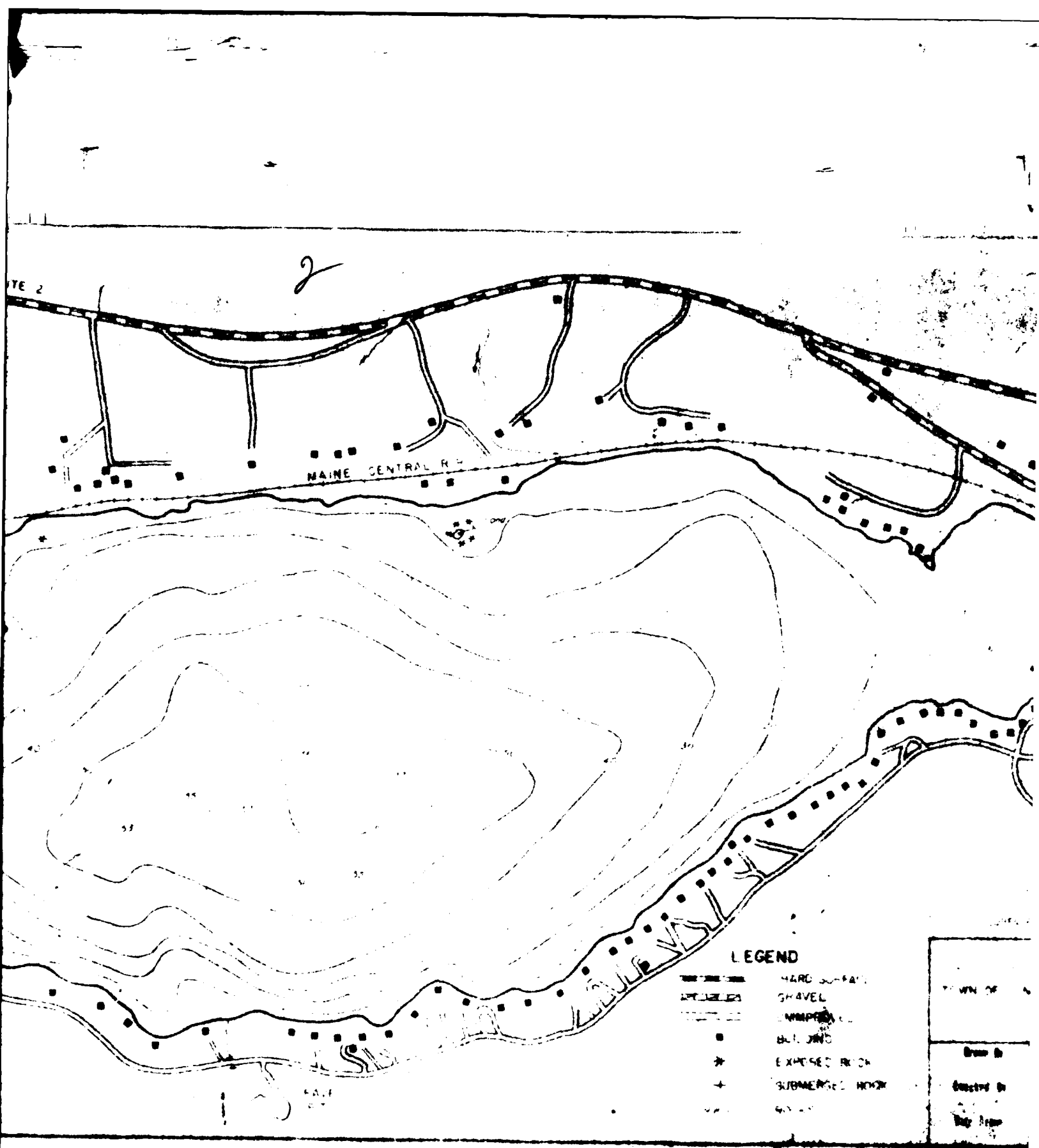
6861 MILESTON DRI R/P RAP FAILURE

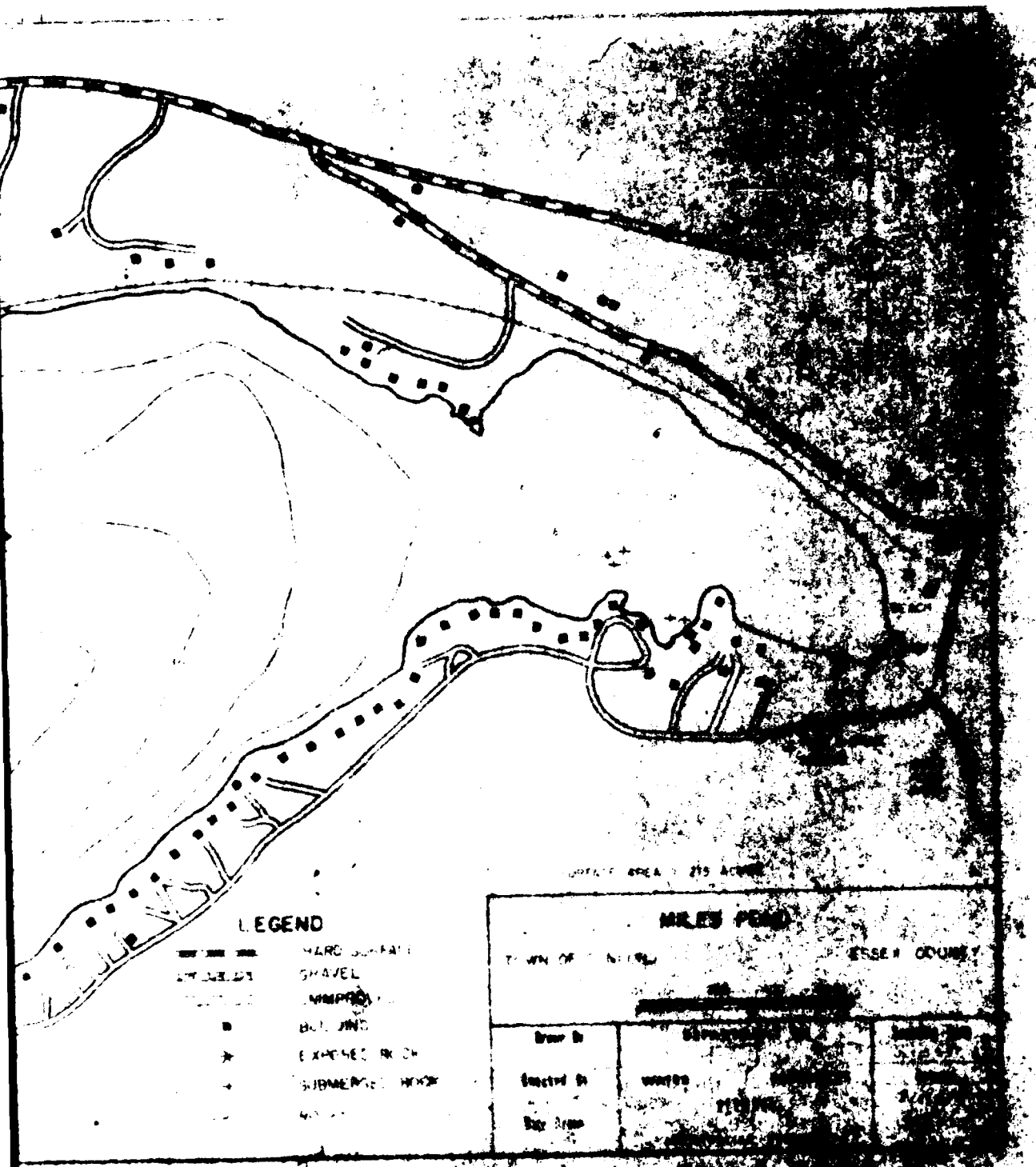
SEP 30 1970



6861 MILESTON - R/P RAP FAILURE SEP 30 1970







WATER RESOURCES
DIVISION
BUREAU OF REVENUE
PUNTS



ASSUMED

ORIGINAL DRAWING PREPARED BY
DUBOIS & KING RANDOLPH, VERMONT 1968

DEBES

THE UNITED STATES OF AMERICA

1942

THE UNITED STATES OF AMERICA
DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF STAFF
WASHINGTON, D. C.

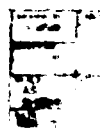
• THE UNITED STATES OF AMERICA
DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF STAFF
WASHINGTON, D. C.



DEBES & KNOX
1000 15th Street, N.W.
Washington, D. C.

DEPARTMENT OF THE ARMY

OFFICE OF THE CHIEF OF STAFF





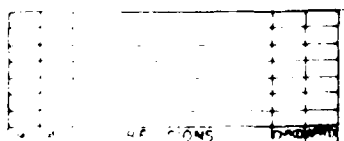
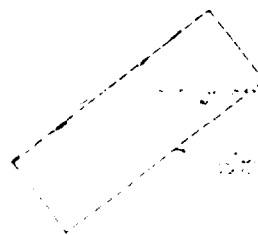
PRECEDING PAGE BLANK-NOT FILMED

ASSUMED DATUM

ORIGINAL DRAWING PREPARED BY
BOB BOIS & KING RANDOLPH, VERMONT 1968

[illegible]

2



DEPARTMENT OF WATER RESOURCES

PROPOSED IMPROVEMENTS



ORIGINAL DRAWING PREPARED BY:
DUBOIS & KING RANDOLPH, VERMONT 1968

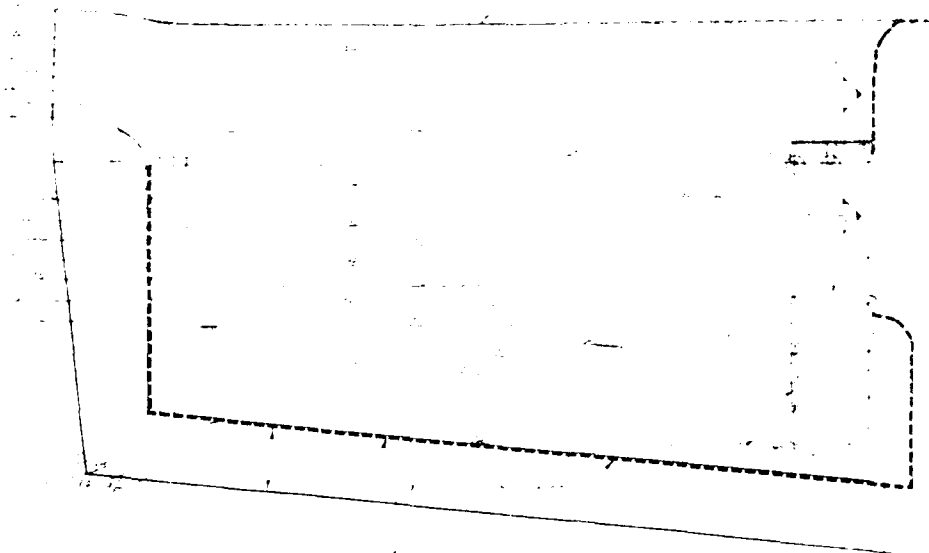
2



DUBOIS & KING
ENGINEERS-PLANNERS
2000 E. 10TH AVE. SPOKANE, IDAHO 83402

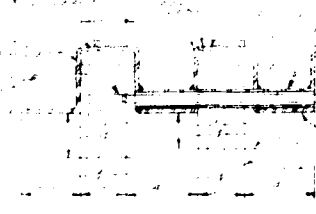
DEPARTMENT OF WATER RESOURCES
WILES POND DAM
STRUCTURAL DETAILS

| | |
|-------------|-------------|
| DESIGNED BY | PROJECT NO. |
| 1-1774 | 0000 |
| SCALE | REVISIONS |
| AS SHOWN | |
| DATE | |
| 09/01/00 | |



100' 0" 0"

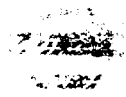
100' 0" 0"



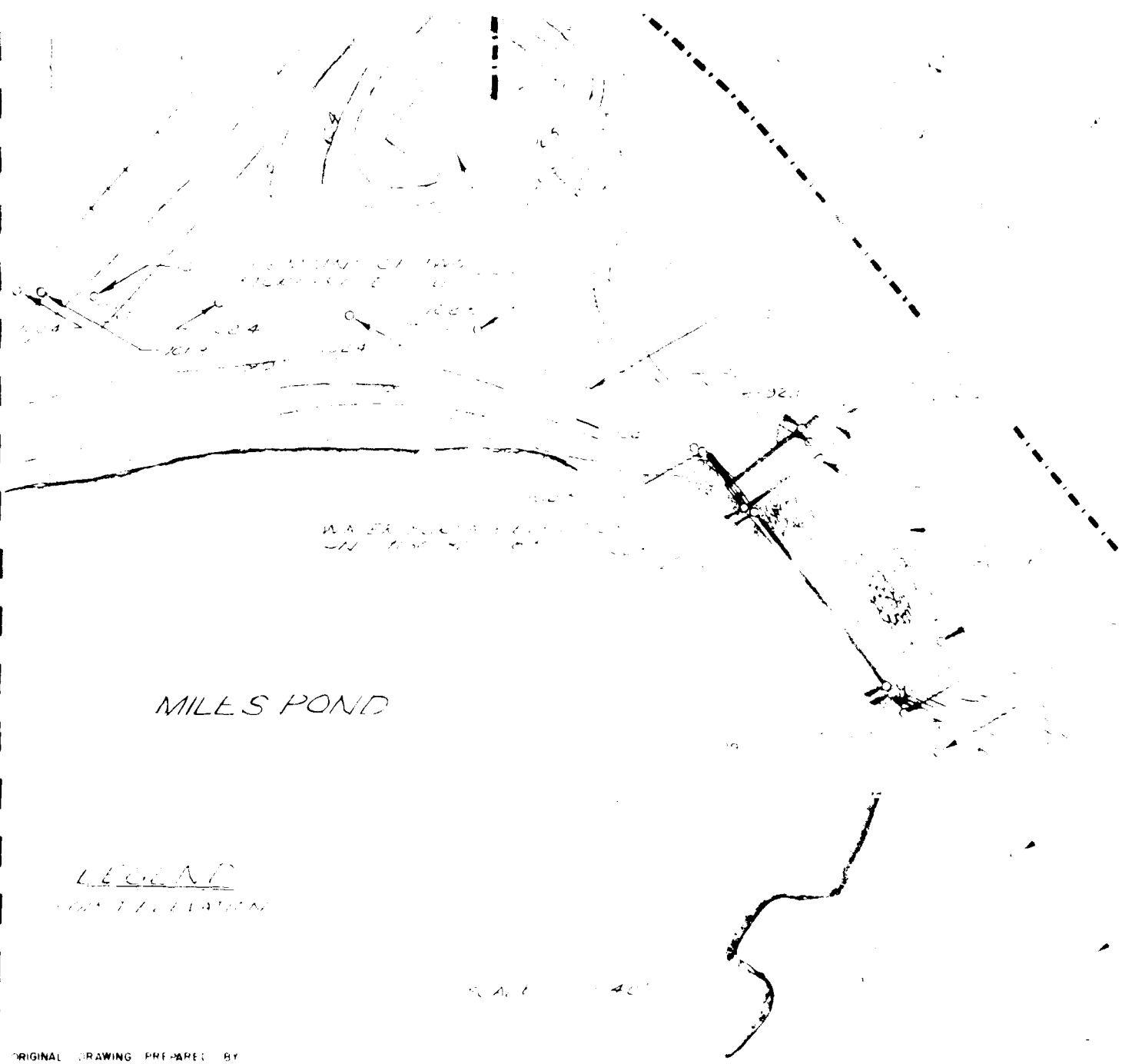
ORIGINAL DRAWING PREPARED BY
DUBOIS & KING RANDOLPH, VERMONT 1968

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2



**DuBois
& King**
INCORPORATED
MANUFACTURING COMPANY



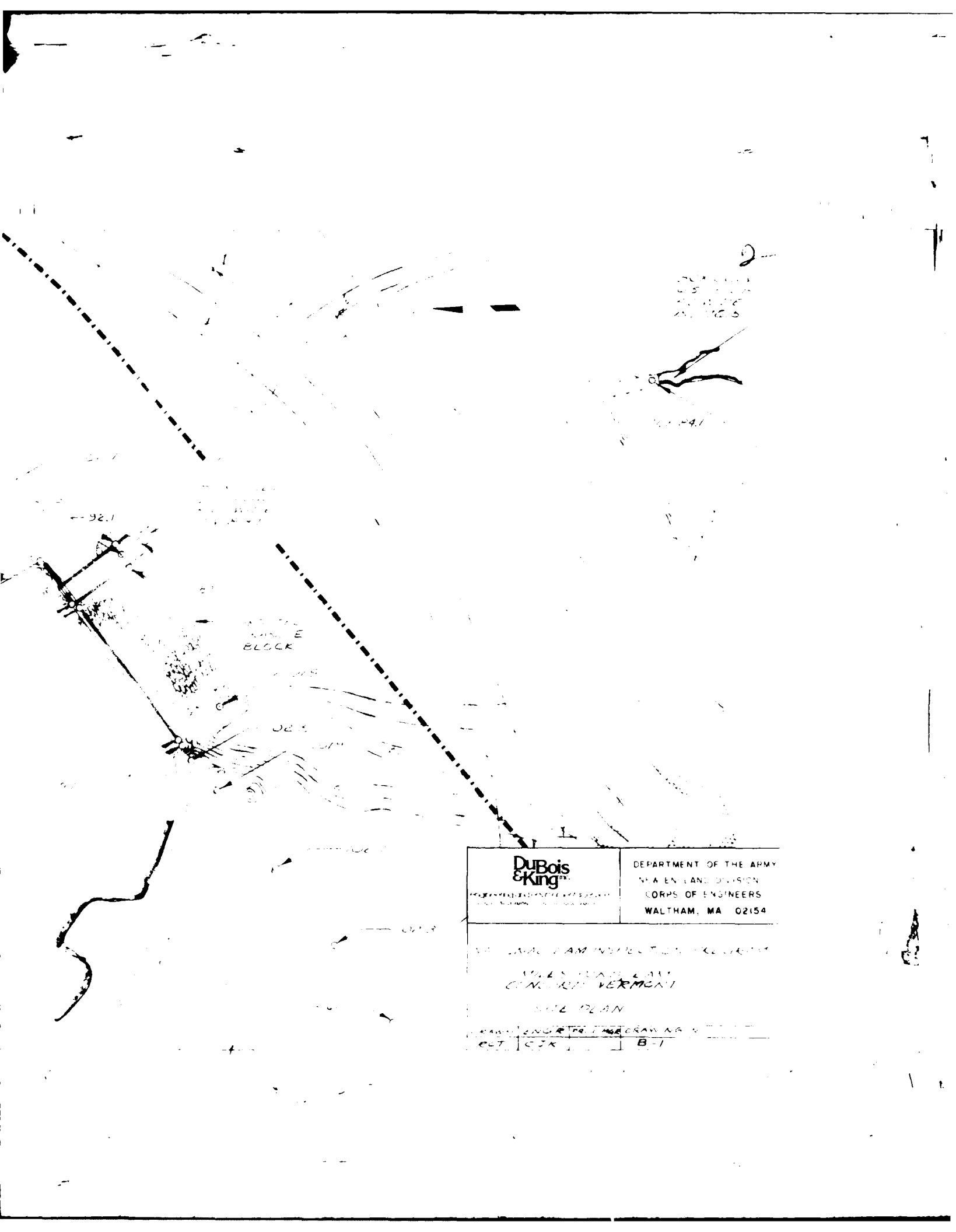
MILES POND

LEGEND

WATER FLOW

ORIGINAL DRAWING PREPARED BY
LUBOIS B KING RANDOLPH, VERMONT 1968

PRECEDING PAGE BLANK-NO. FILMED



2-
DAM
POWERHOUSE
BLOCK
DAM

92.1

92.1

POWERHOUSE
BLOCK

92.5

DuBois
& King

ENGINEERS AND ARCHITECTS
100 N. BOSTON ST. BOSTON, MASS.

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MA 02154

1. DAM AND POWERHOUSE BLOCK

2. DAM AND POWERHOUSE BLOCK

CONCRETE VERMONT

SITE PLAN

SCALE 1" = 100' DRAWN BY

RET. CJK B-1

A hand-drawn map of the Mile's Pond area. The map features several key elements:

- Top Center:** "REMAINS OF TWO STORY FRAME HOUSE" with a small rectangular outline and dashed lines indicating its footprint.
- Top Right:** "FOX CUB, 61 HRS. SINCE AREA" with a small circle and a dashed line pointing to a location.
- Center:** "MILE'S POND" with a large, irregular shape representing the pond.
- Bottom Center:** "ROUTED GRANITE BLOCK" with a small circle and a dashed line pointing to a location.
- Bottom Left:** "LEGEND" with a dashed line and arrow pointing to the text "DIRECTION OF PHOTOGRAPHS".
- Bottom Right:** "SCALE 1" = 40' with a small circle and a dashed line pointing to a location.
- Other Features:** A dashed line runs diagonally across the top right. A solid line runs horizontally across the middle. A solid line runs vertically on the left. A solid line runs diagonally on the right. A solid line runs horizontally at the bottom. A solid line runs vertically on the right. A solid line runs diagonally on the right. A solid line runs horizontally at the bottom. A solid line runs vertically on the right. A solid line runs diagonally on the right.

ROUTED
GRANITE
BLOCK

LEGEND


SCALE : 1" = 40'

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BOX CULV.
65' HIGH
52' WIDE
IN 765

BOX CULV.
61' HIGH
52' WIDE
IN 765

ROUTED
GRAVITY
BLOCK

| | | | |
|--|------|---|-------------|
|  engineering and construction services 1000 W. 10th St., Suite 100, Waltham, MA 02154 | | DEPARTMENT OF THE ARMY NEW ENGLAND DIVISION CORPS OF ENGINEERS WALTHAM, MA 02154 | |
| NATIONAL DAM INSPECTION PROGRAM LES POND DAM CONCORD, VERMONT PHOTO LOCATIONS | | | |
| DATE | ENGR | PROJ | DRAWING NO. |
| 8-2 | CJK | | 8-2 |

APPENDIX C
PHOTOGRAPHS

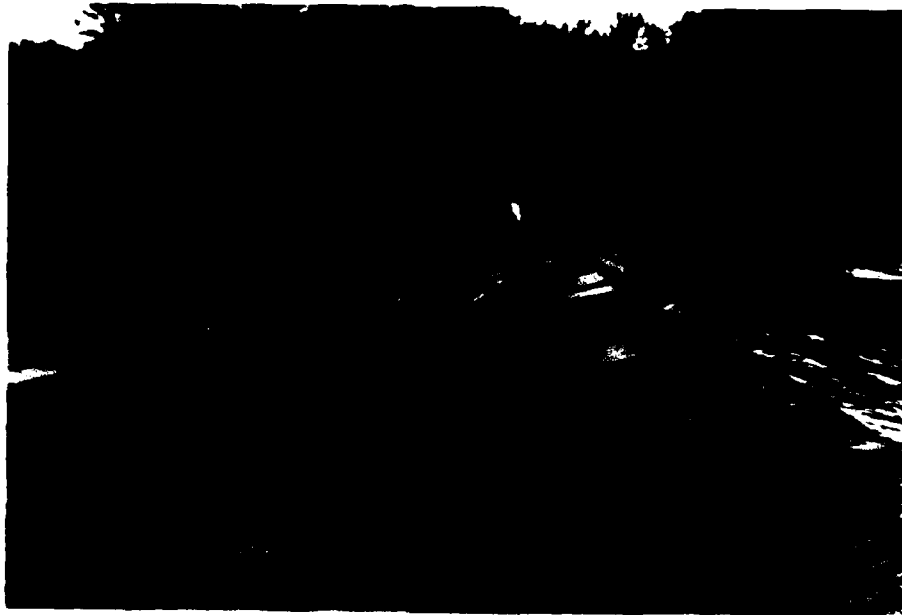
FOR LOCATION OF PHOTOS, SEE FIGURE B-2
LOCATED IN APPENDIX B



#1 - Looking upstream at dam, principal and
emergency spillway



#2 - Crest of dam and left abutment viewed from
principal spillway (stop log chute spillway)



#3 - Crest of emergency spillway, crest of dam and
right abutment viewed from principal spillway
(stop log chute spillway)



#4 - Emergency spillway viewed from right end of
spillway



#5 - Grouting failure on downstream face of the granite-block emergency spillway basin



#6 - $\frac{1}{2}$ inch crack between 12 inch concrete cutoff wall and the grouted granite-block emergency



#7 - From left bank, looking downstream, at grassed waterway downstream of emergency spillway



#8 - Looking upstream at principal spillway (stop log chute spillway)



#9 - Looking downstream, from stop log structure, at the downstream end of the principal spillway (chute spillway and concrete box culvert)



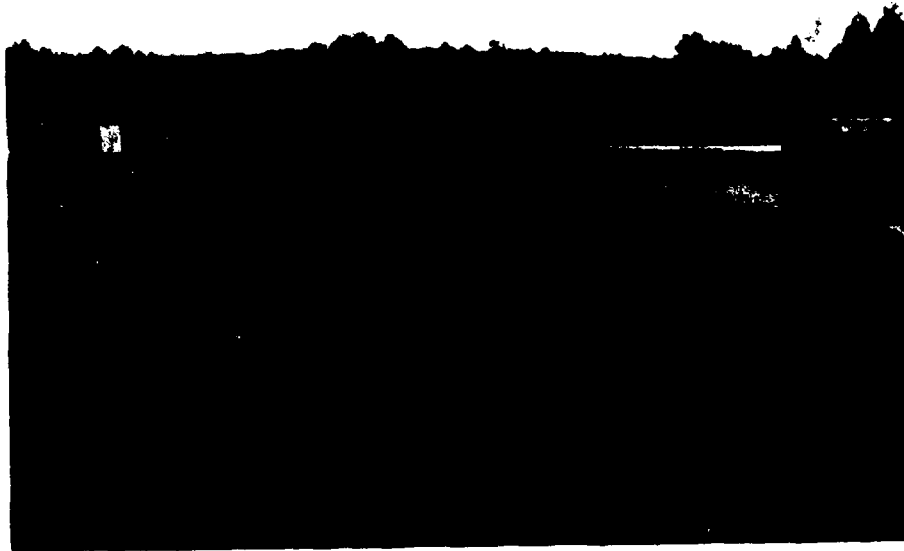
#10 - Looking upstream at the discharge end of the principal spillway (concrete box culvert)



#11 - Looking upstream at left invert side of the
discharge end of the concrete box culvert



#12 - Viewed from the left bank looking downstream at principal and emergency spillway



#13 - Viewed from the right bank looking downstream
at emergency and principal spillway



#14 - Looking downstream at discharge channel at discharge
end of principal spillway

APPENDIX D
HYDROLOGIC & HYDRAULIC CALCULATIONS

Job No. 9555 Sheet 1 of 30
Project TILE ROAD DATA Date 10-15-80
Subject DRAINAGE AREA By SK Ch'k. by _____

FROM U.S.G.S. LITTLETON, VT. - N.H. QUADRANGLE
SCALE 1:62500

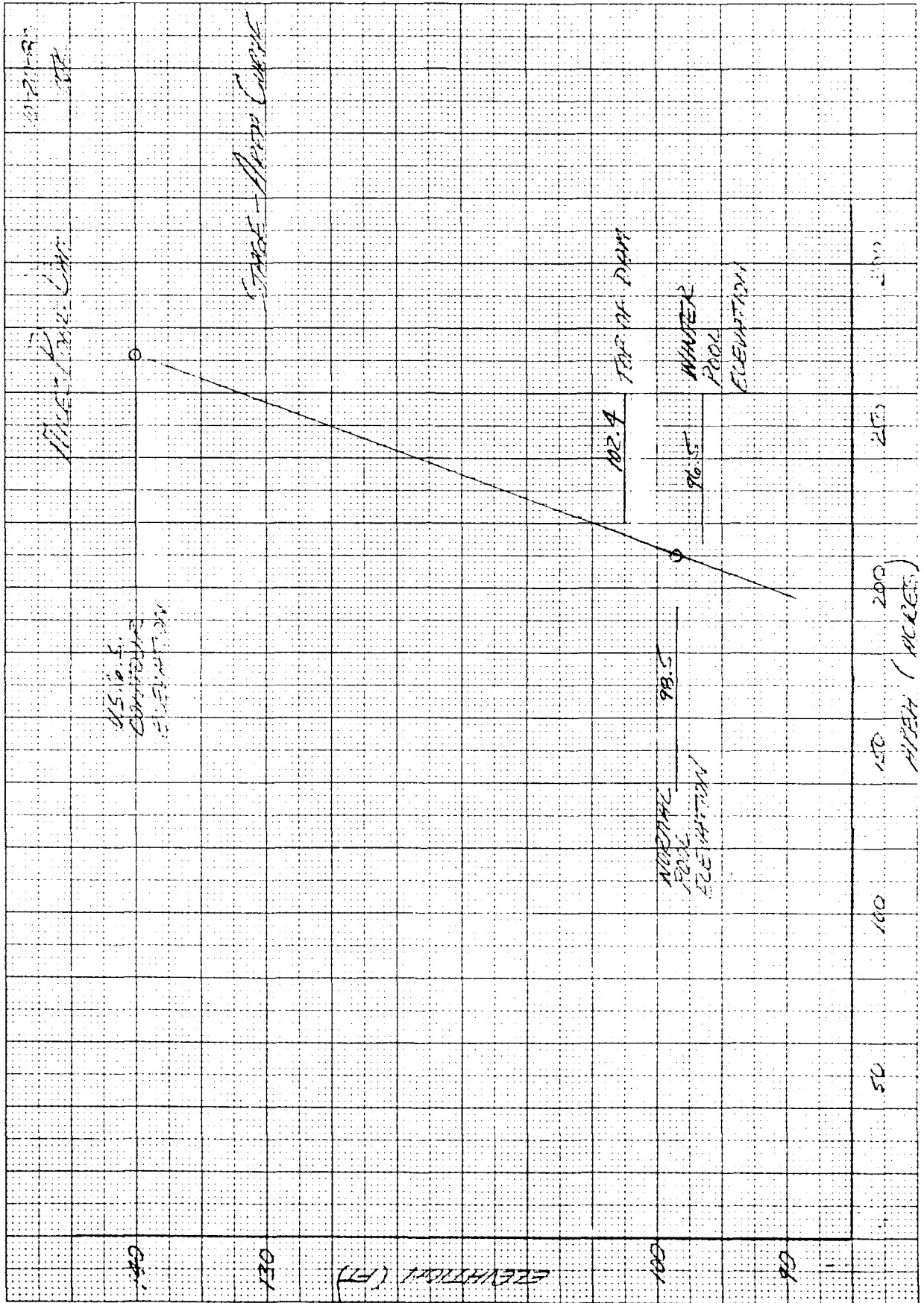
RAIN GAGE READINGS

| | |
|-------|------|
| 20.00 | 6.85 |
| 26.85 | 6.85 |
| 32.70 | 6.85 |
| 40.55 | 6.85 |

$$6.85 \text{ in}^2 (0.972) = 6.7 \text{ in}^2$$

$$\text{AVE. RENDING} = 6.85 \text{ in}^2$$

$$\text{DRAINAGE AREA} = 6.7 \text{ in}^2$$



Job No. 90-55 Sheet 4 of 30
 Project MILES Pond Dam Date 10-20-80
 Subject STAGE - VOLUME CURVE By JK Ch'k. by

DATA OBTAINED FROM U.S.G.S. MAP MILES POND VT.-NH. (7.5 MINUTE)
 SCALE 1:24000 (MAY 1967)

| ELEVATION | | AREA (ACRES) | $\frac{H_1+H_2}{2}$ | DEPTH (FT) | INCREMENTAL VOLUME (AC-FT) | TOTAL VOLUME (AC-FT) |
|-----------|----------------------------------|--------------------|---------------------|------------------|----------------------------------|----------------------------|
| 96.5 | WINTER POOL ELEVATION | 207.5 ^① | 208.9 | 2 | 417.8 | 949 ^④ |
| 98.5 | NORMAL POOL ELEVATION | 210.3 ^① | | 6.5 ^③ | — | 1367 |
| 102.4 | TOP OF DAM | 216.2 ^② | 213.3 | 3.9 | 831.9 | 2199 ^④ |
| 140 | U.S.G.S. CONTROL ELEVATION | 271.8 ^① | | | | |

① MEASURED FROM THE U.S.G.S. MAP SCALE 1:24000

② TAKEN FROM STAGE-AREA CURVE DEVELOPED FROM U.S.G.S. MAP

③ TAKEN FROM THE VERMONT DEPARTMENT OF WINTER RESOURCES
 SCOURING MAP FOR MILES POND, REVISED DATED 7-11-73.

④ CALCULATED USING AREAS OBTAINED FROM STAGE-AREA
 CURVE DEVELOPED FROM U.S.G.S. MAP

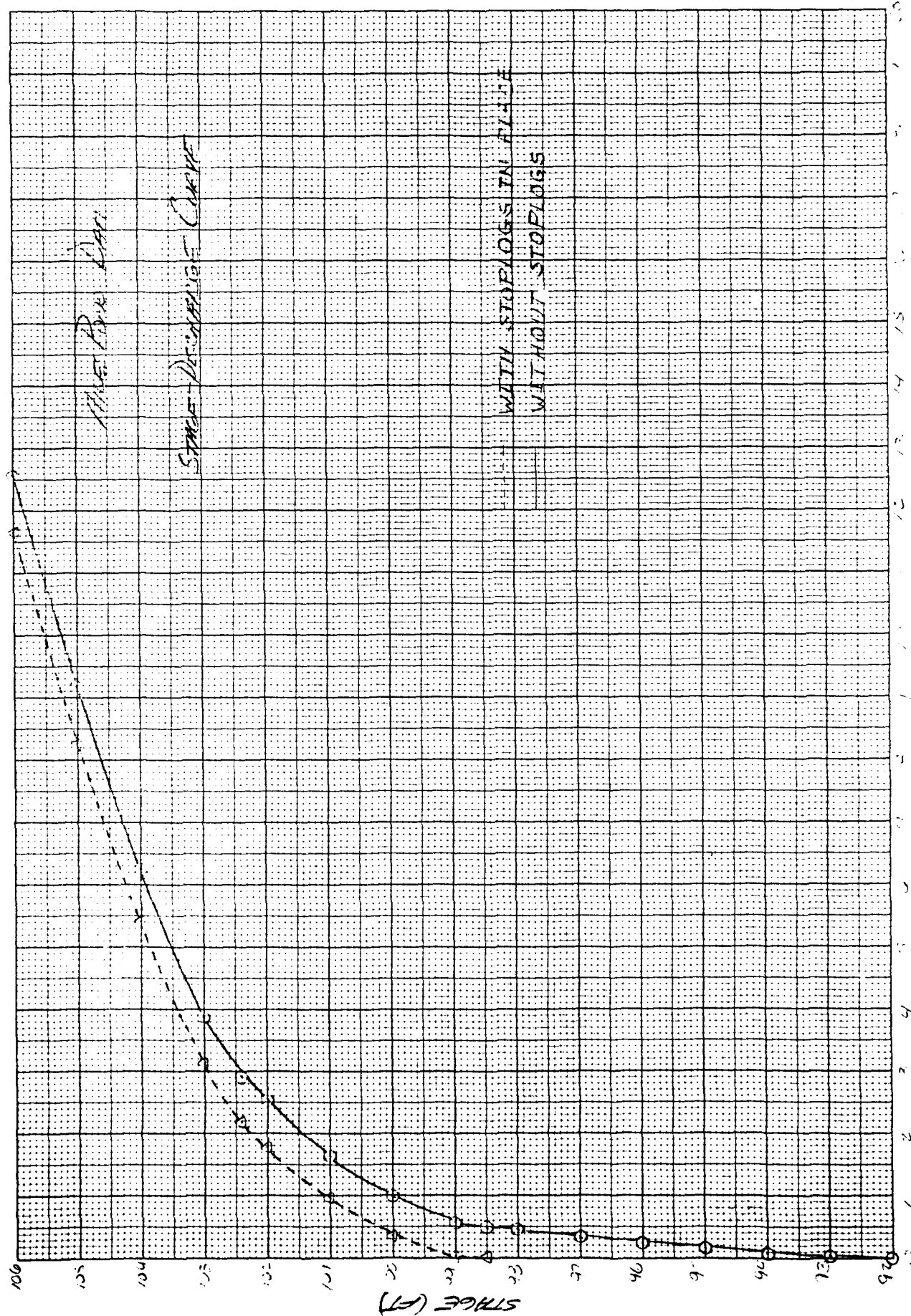
Job No. 90525 Sheet 5 of 30
 Project Milton Pond Dam Date 10/17/87
 Subject Hydrology - Hydrology By Ch'k. by

DISCHARGE CURVE

| | | | |
|--------------|--|---------------|--|
| ① | | ② | |
| Elev. 100.0' | | Elev. 93.5' | |
| | | Elev. 90.0' | |
| | | Elev. 86.5' | |
| | | Elev. 83.0' | |
| | | Elev. 79.5' | |
| | | Elev. 76.0' | |
| | | Elev. 72.5' | |
| | | Elev. 69.0' | |
| | | Elev. 65.5' | |
| | | Elev. 62.0' | |
| | | Elev. 58.5' | |
| | | Elev. 55.0' | |
| | | Elev. 51.5' | |
| | | Elev. 48.0' | |
| | | Elev. 44.5' | |
| | | Elev. 41.0' | |
| | | Elev. 37.5' | |
| | | Elev. 34.0' | |
| | | Elev. 30.5' | |
| | | Elev. 27.0' | |
| | | Elev. 23.5' | |
| | | Elev. 20.0' | |
| | | Elev. 16.5' | |
| | | Elev. 13.0' | |
| | | Elev. 9.5' | |
| | | Elev. 6.0' | |
| | | Elev. 2.5' | |
| | | Elev. 0.0' | |
| | | Elev. -3.5' | |
| | | Elev. -7.0' | |
| | | Elev. -10.5' | |
| | | Elev. -14.0' | |
| | | Elev. -17.5' | |
| | | Elev. -21.0' | |
| | | Elev. -24.5' | |
| | | Elev. -28.0' | |
| | | Elev. -31.5' | |
| | | Elev. -35.0' | |
| | | Elev. -38.5' | |
| | | Elev. -42.0' | |
| | | Elev. -45.5' | |
| | | Elev. -49.0' | |
| | | Elev. -52.5' | |
| | | Elev. -56.0' | |
| | | Elev. -59.5' | |
| | | Elev. -63.0' | |
| | | Elev. -66.5' | |
| | | Elev. -70.0' | |
| | | Elev. -73.5' | |
| | | Elev. -77.0' | |
| | | Elev. -80.5' | |
| | | Elev. -84.0' | |
| | | Elev. -87.5' | |
| | | Elev. -91.0' | |
| | | Elev. -94.5' | |
| | | Elev. -98.0' | |
| | | Elev. -101.5' | |
| | | Elev. -105.0' | |
| | | Elev. -108.5' | |
| | | Elev. -112.0' | |
| | | Elev. -115.5' | |
| | | Elev. -119.0' | |
| | | Elev. -122.5' | |
| | | Elev. -126.0' | |
| | | Elev. -129.5' | |
| | | Elev. -133.0' | |
| | | Elev. -136.5' | |
| | | Elev. -140.0' | |
| | | Elev. -143.5' | |
| | | Elev. -147.0' | |
| | | Elev. -150.5' | |
| | | Elev. -154.0' | |
| | | Elev. -157.5' | |
| | | Elev. -161.0' | |
| | | Elev. -164.5' | |
| | | Elev. -168.0' | |
| | | Elev. -171.5' | |
| | | Elev. -175.0' | |
| | | Elev. -178.5' | |
| | | Elev. -182.0' | |
| | | Elev. -185.5' | |
| | | Elev. -189.0' | |
| | | Elev. -192.5' | |
| | | Elev. -196.0' | |
| | | Elev. -199.5' | |
| | | Elev. -203.0' | |
| | | Elev. -206.5' | |
| | | Elev. -210.0' | |
| | | Elev. -213.5' | |
| | | Elev. -217.0' | |
| | | Elev. -220.5' | |
| | | Elev. -224.0' | |
| | | Elev. -227.5' | |
| | | Elev. -231.0' | |
| | | Elev. -234.5' | |
| | | Elev. -238.0' | |
| | | Elev. -241.5' | |
| | | Elev. -245.0' | |
| | | Elev. -248.5' | |
| | | Elev. -252.0' | |
| | | Elev. -255.5' | |
| | | Elev. -259.0' | |
| | | Elev. -262.5' | |
| | | Elev. -266.0' | |
| | | Elev. -269.5' | |
| | | Elev. -273.0' | |
| | | Elev. -276.5' | |
| | | Elev. -280.0' | |
| | | Elev. -283.5' | |
| | | Elev. -287.0' | |
| | | Elev. -290.5' | |
| | | Elev. -294.0' | |
| | | Elev. -297.5' | |
| | | Elev. -301.0' | |
| | | Elev. -304.5' | |
| | | Elev. -308.0' | |
| | | Elev. -311.5' | |
| | | Elev. -315.0' | |
| | | Elev. -318.5' | |
| | | Elev. -322.0' | |
| | | Elev. -325.5' | |
| | | Elev. -329.0' | |
| | | Elev. -332.5' | |
| | | Elev. -336.0' | |
| | | Elev. -339.5' | |
| | | Elev. -343.0' | |
| | | Elev. -346.5' | |
| | | Elev. -350.0' | |
| | | Elev. -353.5' | |
| | | Elev. -357.0' | |
| | | Elev. -360.5' | |
| | | Elev. -364.0' | |
| | | Elev. -367.5' | |
| | | Elev. -371.0' | |
| | | Elev. -374.5' | |
| | | Elev. -378.0' | |
| | | Elev. -381.5' | |
| | | Elev. -385.0' | |
| | | Elev. -388.5' | |
| | | Elev. -392.0' | |
| | | Elev. -395.5' | |
| | | Elev. -399.0' | |
| | | Elev. -402.5' | |
| | | Elev. -406.0' | |
| | | Elev. -409.5' | |
| | | Elev. -413.0' | |
| | | Elev. -416.5' | |
| | | Elev. -420.0' | |
| | | Elev. -423.5' | |
| | | Elev. -427.0' | |
| | | Elev. -430.5' | |
| | | Elev. -434.0' | |
| | | Elev. -437.5' | |
| | | Elev. -441.0' | |
| | | Elev. -444.5' | |
| | | Elev. -448.0' | |
| | | Elev. -451.5' | |
| | | Elev. -455.0' | |
| | | Elev. -458.5' | |
| | | Elev. -462.0' | |
| | | Elev. -465.5' | |
| | | Elev. -469.0' | |
| | | Elev. -472.5' | |
| | | Elev. -476.0' | |
| | | Elev. -479.5' | |
| | | Elev. -483.0' | |
| | | Elev. -486.5' | |
| | | Elev. -490.0' | |
| | | Elev. -493.5' | |
| | | Elev. -497.0' | |
| | | Elev. -500.5' | |
| | | Elev. -504.0' | |
| | | Elev. -507.5' | |
| | | Elev. -511.0' | |
| | | Elev. -514.5' | |
| | | Elev. -518.0' | |
| | | Elev. -521.5' | |
| | | Elev. -525.0' | |
| | | Elev. -528.5' | |
| | | Elev. -532.0' | |
| | | Elev. -535.5' | |
| | | Elev. -539.0' | |
| | | Elev. -542.5' | |
| | | Elev. -546.0' | |
| | | Elev. -549.5' | |
| | | Elev. -553.0' | |
| | | Elev. -556.5' | |
| | | Elev. -560.0' | |
| | | Elev. -563.5' | |
| | | Elev. -567.0' | |
| | | Elev. -570.5' | |
| | | Elev. -574.0' | |
| | | Elev. -577.5' | |
| | | Elev. -581.0' | |
| | | Elev. -584.5' | |
| | | Elev. -588.0' | |
| | | Elev. -591.5' | |
| | | Elev. -595.0' | |
| | | Elev. -598.5' | |
| | | Elev. -602.0' | |
| | | Elev. -605.5' | |
| | | Elev. -609.0' | |

Job No. _____ Sheet 6 of 30
Project M. D. Road Date 11/10/10
Subject Drainage Rating Curve By 215 Ch'k. by _____

| Elevation (ft) | 2 nd (ft) | 2 nd (ft) | 2 nd (ft) | 2 nd (ft) |
|-------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| 42 | | | | |
| 92 | | | | |
| 94 | | | | |
| 95 | | | | |
| 96 | | | | |
| 97 | | | | |
| 98 | | | | |
| 98.5 | | | | |
| 99 | | | | |
| 100 | | | | |
| 101 | | | | |
| 102 | | | | |
| 102.4 | | | | |
| 103 | | | | |
| 104 | | | | |
| 105 | | | | |
| 106 | | | | |
| 107 | | | | |



Job No. 9855 Sheet 8 of 30
 Project Miles Pond Dam Date 10-16-80
 Subject HEC-1 HYDRAULIC-HYDROLOGY By SK-Ch'k. by

BACK-UP COMPUTATIONS FOR HEC-1

DRAINAGE AREA = 6.7 mi^2

LOSS RATES

1904 General Soils Map - Essex County, VT
 Miles Pond Watershed

PERC - Shallow Association 70%
 LIMN - Shallow - PERC Association 30%

PERC }
 SHALLOW } GROUP C SOILS (FROM DESIGN OF SMALL DAMS p.527)
 LIMN }

WATERSHED IS 100% WOODLANDS

THE CURVE NO. FOR THE MILES POND WATERSHED WAS
 OBTAINED FROM FIGURE H-2 (p.537)

NOTE: ZONES OF MUDS & THE MUDS IS MODERATELY
 COMPACT

FROM FIG. H-2 (2) $HC = 3$
 FROM FIG. H-2 (2) $CN = 73$ (A/C-II)

I_a (INITIAL ABSTRACTION) = 0.74 IN (p.543)

Cont. Loss Rate 0.15 "/hr (p.543)

FROM DESIGN OF SMALL DAMS (p.45+46)

$P_{112} = 19.5" (6-in) (10 \text{ mi}^2)$

$R_6 = 100$

$R_{12} = 111$

$R_{24} = 120$

Job No. 9655 Sheet 9 of 30
 Project NILES Pond Dam Date 10-16-80
 Subject HEL-1 HYDRAULICS - HYDROLOGY By SK Ch'k. by

SWAMP - RILL

$$t_p = C_t (L L_{cm})^{0.3}$$

t_p = LAG TIME

U.S.G.S. MAPS
 1:62500

L = LENGTH OF MAIN WATERCOURSE TO UPSTREAM
 LIMIT OF DRAINAGE AREA = 4.36 MILES

L_{cm} = LENGTH ALONG MAIN WATERCOURSE
 TO POINT OPPOSITE THE CENTROID
 OF THE DRAINAGE AREA = 1.99 MILES

C_t = SWAMP RILL COEFFICIENT = 2.0 (AVERAGE)

C_p = SWAMP RILL COEFFICIENT = 0.63
 FROM CHAN'S HANDBOOK OF
 APPLIED HYDROLOGY

$$t_p = 2.0 (1.99)^{0.3}$$

$t_p = 3.5$ HRS

$$\frac{23,000'}{2175} = 3.2 \text{ HRS}$$

AND $t_p = 3.5$ HRS

Job No. 91855 Sheet 10 of 30
 Project MILES Pond Dam Date 10-20-80
 Subject HYDRAULICS - HYDROLOGY By JL Ch'k. by

MILES Pond Dam - Located in Concord, VT.

CLASSIFICATION - SIZE - INTERMEDIATE (HIGH STORAGE 2199 AC-FT)

Hazard - High (RURAL COMMUNITY OF
 EAST CONCORD, APPROX.
 2.5 MILES DOWNSTREAM
 " DAM)

BASIC DATA

Drainage Area = 6.7 mi²

RESERVOIR

Winter Pool Elevation = 96.5 FT.

Winter Pool Storage = 949 AC-FT

Normal Pool Elevation = 98.5 FT

" " Storage = 1367 AC-FT

Maximum Pool Elevation (Top of Dam) = 102.4 FT

" " Storage = 2199 AC-FT

DAM

PRINCIPAL SPILLWAY - STOP LOG CHUTE SPILLWAY, INTO
 A DECHARGE CURT

EMERGENCY SPILLWAY - 90 FOOT CONCRETE SILL INTO A
 GROUTED GRANITE - BLOCK BASIN ONTO A GRASED
 WINTERWAY.

RIGHT AND LEFT EMBANKMENTS - EARTH FILL

Job No. 7855 Sheet 11 of 30
 Project WILES Pond Dam Date 11-19-81
 Subject Hydrology - Hydrology By JLK Ch'k. by

HEL-1 WAS USED TO CALCULATE THE DESIGN FLOOD FOR WILES POND DAM.

CIRCUMSTANCES SIZE - INTERMEDIATE
 HAZARD - HIGH

DESIGN FLOOD

HYDROLOGIC EVALUATION GUIDELINES RECOMMENDS THE DESIGN FLOOD BE A FULL PMP.

$$Q_{PMP} = 12,025 \text{ CFS (SEE HEL-1 COMPUTER PRINTOUTS)}$$

$$Q_{\frac{1}{2}PMP} = 6,018 \text{ CFS}$$

EFFECT OF SURCHARGE STORAGE ON DESIGN FLOOD

THE EFFECTS OF SURCHARGE WERE MODELED USING THE HEL-1 FLOOD HYDROGRAPH PACKAGE.

| DESIGN FLOOD | DURING ROUTING | | RESERVOIR STAGE (FT) | PERCENT REDUCTION OF DESIGN FLOOD |
|------------------------------------|----------------------|------------------------|----------------------|-----------------------------------|
| | DAINTY OUTFLOW (CFS) | MAXIMUM STORAGE (K-FT) | | |
| PMP $Q_p = 12,025$ | 11,273 | 2967 | 105.8 | 6% |
| $\frac{1}{2}$ PMP $Q_p = 6,018$ | 5,148 | 2537 | 103.7 | 14% |

CONCLUSIONS

THE RESERVOIR STORAGE WILL REDUCE THE PMP DESIGN FLOW BY 6%. THE STORAGE WILL REDUCE THE $\frac{1}{2}$ PMP FLOW BY 14%.

THE DAM OUTLETS CAN ONLY PASS 2158 CFS BEFORE THE DAM OVERTOPS. (18% OF THE PMP DESIGN FLOOD)

THE PMP DESIGN FLOOD WILL RESULT IN THE DAM BEING OVERTOPPED BY 3.4 FEET. THE $\frac{1}{2}$ PMP DESIGN FLOOD WILL RESULT IN THE DAM BEING OVERTOPPED BY 1.3 FEET.

Job No. 71555 Sheet 12 of 30
Project WATER POND DRAIN Date 10-23-80
Subject HYDRAULICS - HYDROLOGY By JK Ch'k. by

THE DESIGN FLOOD (PIIP) WILL ROUTED THROUGH THE
STRUCTURE, ASSUMING THE POND TO BE AT NORMAL POOL
ELEVATION OF 98.5 FT (INITIAL STORAGE = 1367 AC-FT).

Job No. 90555 Sheet 13 of 30
 Project MILES POND DAM Date 12-21-80
 Subject HYDRAULICS - HYDROLOGY By SK Ch'k. by

DAM FAILURE ANALYSIS

- ASSUMPTIONS - ① THE HYDRAULIC STRUCTURE HAS
 A WATER LEVEL EQUAL TO 102.4 FEET OR
 TOP OF DAM, JUST PRIOR TO DAM FAILURE.
 ② THE DISCHARGE JUST PRIOR TO DAM
 FAILURE IS EQUAL TO SPILLWAY CAPACITY
 DISCHARGE THAT IS 2158 CFS.
 ③ BREACH WIDTH (W_b) IS EQUAL TO 40% OF
 EFFECTIVE DAM LENGTH (467 FT.) $W_b = 163$ FT.
 THE FAILURE AT THE MILES POND DAM WOULD
 PROBABLY OCCUR IN THE LEFT AND RIGHT
 EARTH EMBANKMENTS.

HEAD LOSS AT TIME OF FAILURE

$$Q_s = 9.1 \sqrt{H} Y_o^{3/2}$$

Y_o = EMBANKMENT

Q_s = SPILLWAY DISCHARGE

Y_o = TOTAL HEIGHT FROM THE WATER POOL (TOP OF DAM) TO THE
 DOWNSTREAM TOE OF THE DAM, 92.0 FEET

$$Q_s = 9.1 (163) (32.2) (102.4 - 92.0)^{3/2}$$

$$Q_s = 9192 \text{ CFS}$$

DISCHARGE FROM STRUCTURE JUST PRIOR TO DAM FAILURE = 2158 CFS

TOTAL DISCHARGE WHEN DAM FAILS = 9192 + 2158 = 11,350 CFS

Job No. 9132 Sheet 14 of 30
 Project 11000 Pond Dam Date 10-21-81
 Subject Hydrology - Hydrology By SK Ch'k. by

Dam Failure Analysis (cont.)

DOWNSTREAM OF DAM, THE "RULE OF THUMB" GUIDANCE FOR ESTIMATING DOWNSTREAM DAM FAILURE HYDROGRAPH, AND STAGE-DISCHARGE CURVES DEVELOPED BY USING HANNINGS EQUATION, WILL BE UTILIZED TO DETERMINE THE EFFECTS ON THE FLOOD WAVE AS IT MOVES DOWNSTREAM. TYPICAL CROSS-SECTIONS TAKEN OFF THE U.S.G.S. MAP, SCALE 1:24,000, WILL BE USED IN CONJUNCTION WITH HANNINGS EQUATION TO DEVELOP THE STAGE-DISCHARGE CURVES.

HANNINGS EQUATION

$$Q = \frac{1.49}{n} H R^{4/3} S^{1/2}$$

"n" = COMPOSITE "n" VALUE

H = HRECH

R = $\frac{H}{4}$

S = SLOPE OF RUN

Results

LENGTH OF REACH = 3000'

DIFFERENCE IN ELEVATION = 1020 - 985

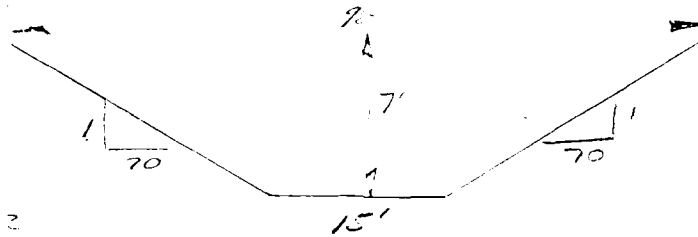
SLOPE = 0.012

COMPOSITE "n" = (SMALLER HRECH) = 0.68

Job No. 70555 Sheet 15 of 30
 Project New Pond Dam Date 11-21-55
 Subject Hydrology - Hydrology By Ch'k. by

Low Flood Peak 1512 (cont.)

Runoff



$$H = b d + z d^2$$

$$P_u = b + 2d \sqrt{z^2 + 1}$$

| Depth | P_u | R | $R^{2/3}$ | Area | z | Q |
|-------|-------|------|-----------|------|-----|--------|
| 2 | 295.0 | 1.05 | 1.13 | 210 | 70 | 651 |
| 4 | 575.1 | 2.05 | 1.62 | 1180 | 70 | 3900 |
| 6 | 825.1 | 3.05 | 2.10 | 2610 | 70 | 11,183 |
| 7 | 915.1 | 3.55 | 2.22 | 3535 | 70 | 14,855 |

AD-A156 261

NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
MILES POND DAM (VT 00..(U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV DEC 80

2/2

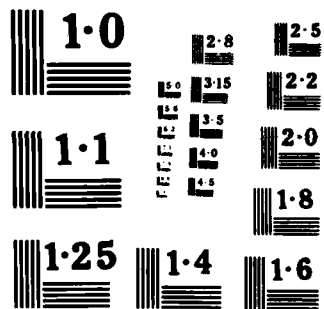
UNCLASSIFIED

F/G 13/13

NL

| | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | |
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END
DATE
18 DEC
1980



Job No. 90855 Sheet 17 of 30
 Project Waste Water Dam Date 11-22-81
 Subject Pressure - Hydrology By J.K. Ch'k. by

DAM FAILURE ANALYSIS (CONT)

Reach #2

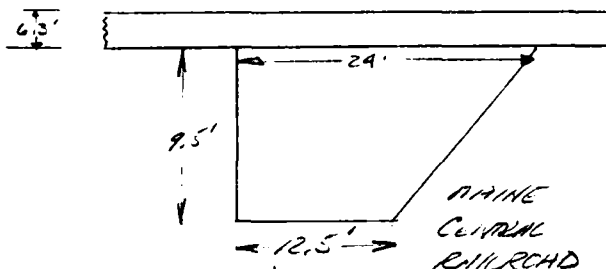
LENGTH = 550 FT

SLOPE = 0.025

COMPOSITE "n" = 0.025

$$Q = \frac{1.49}{0.025} AR^{2/3} (1.485)^{1/2}$$

$$Q = 5.07 AR^{2/3}$$



| DEPTH | P_D | $R^{2/3}$ | Height | Q | DEPTH + $\frac{V^2}{2g}$ |
|-------|-------|-----------|--------|------|--------------------------|
| 2 | 17.6 | 1.24 | 27.4 | 186 | 2.72 |
| 4 | 26.2 | 1.90 | 59.7 | 575 | 5.44 |
| 6 | 27.5 | 2.29 | 96.8 | 1124 | 8.09 |
| 8 | 22.1 | 2.60 | 136.7 | 1828 | 10.69 |
| 9.4 | 36.7 | 2.79 | 170.9 | 2419 | 12.51 |

PRESSURE FLOW

$$Q = A \sqrt{2gH/K}$$

$$A = 173.4 \text{ ft}^2$$

$$K = 1.5 \text{ (assumed)}$$

Assume (Q) = 500 FOR (H)

| Q | Height | H | DOWNSTREAM STAGE* | BED MOORSE UPSTREAM | EGL UPSTREAM |
|-------|--------|-------|-------------------|---------------------|--------------|
| 500 | 173.4 | 0.19 | 2.2 | 0.7 | 3.1 |
| 800 | | 0.50 | 2.7 | | 3.9 |
| 1,000 | | 0.78 | 2.98 | | 4.5 |
| 1,500 | | 1.74 | 3.55 | | 6.0 |
| 2,000 | | 3.10 | 4.05 | | 7.9 |
| 2,500 | | 4.84 | 4.45 | | 10.0 |
| 3,000 | | 6.97 | 4.80 | | 12.5 |
| 3,500 | | 9.49 | 5.13 | | 15.3 |
| 4,000 | | 12.39 | 5.42 | | 18.5 |

* STAGE DOWNSTREAM OF BRIDGE, CALCULATED BY MANNINGS EQUATION.

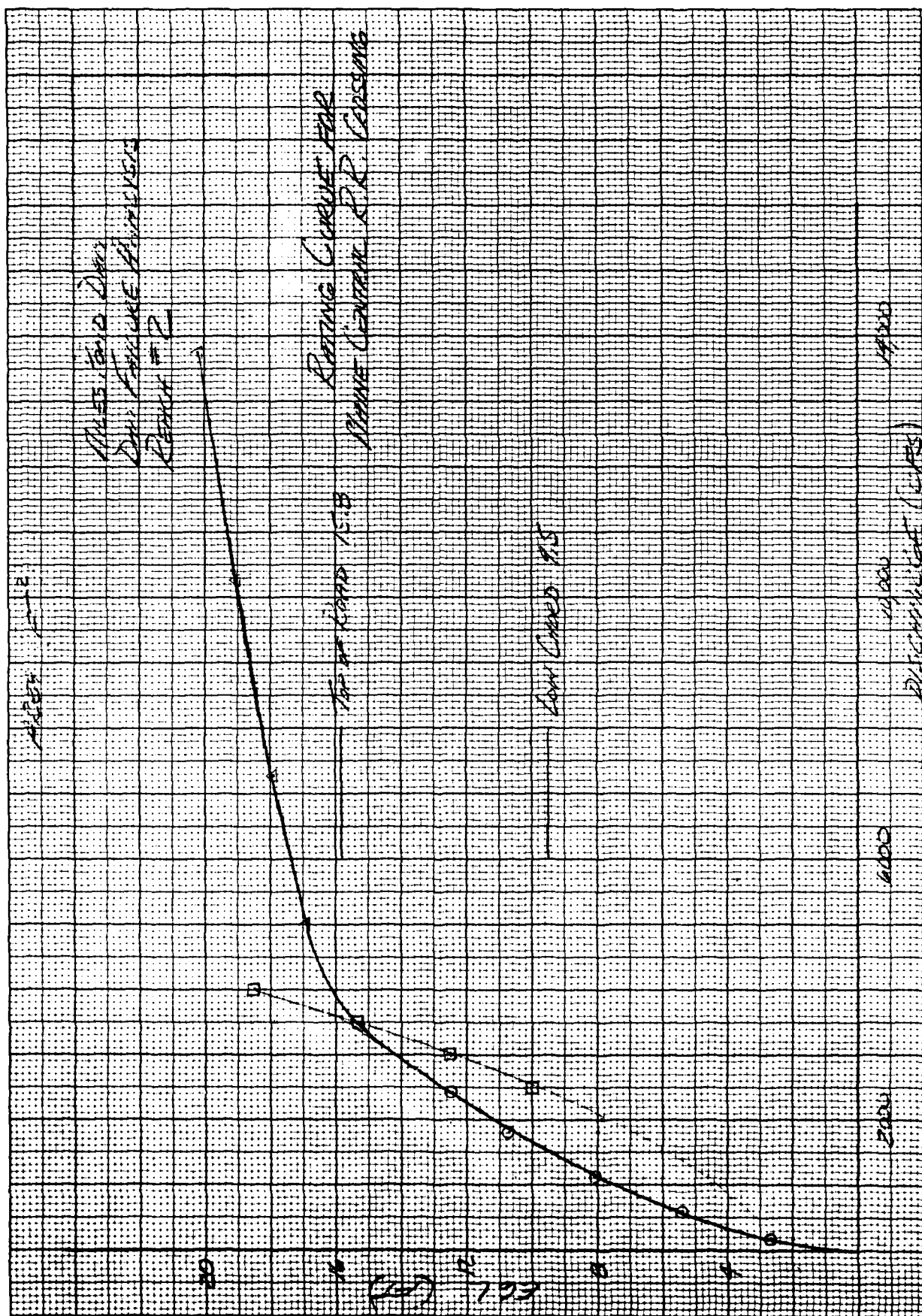
Job No. 90855 Sheet 18 of 30
 Project 17162 Pond Dam Date 10-23-80
 Subject HYDRAULICS - HYDROLOGY By SK Ch'k. by _____

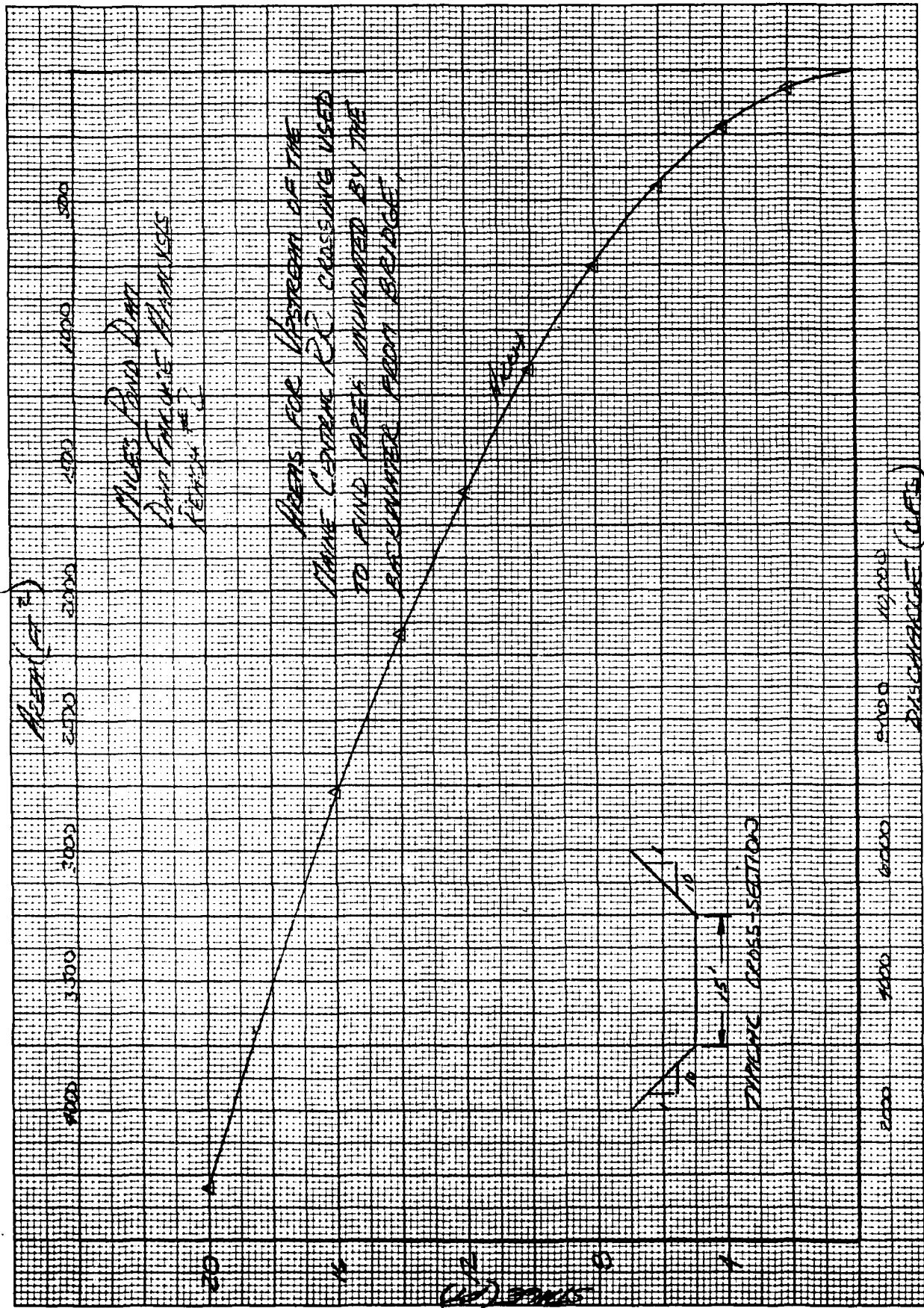
DAM FAILURE ANALYSIS (CON'T)

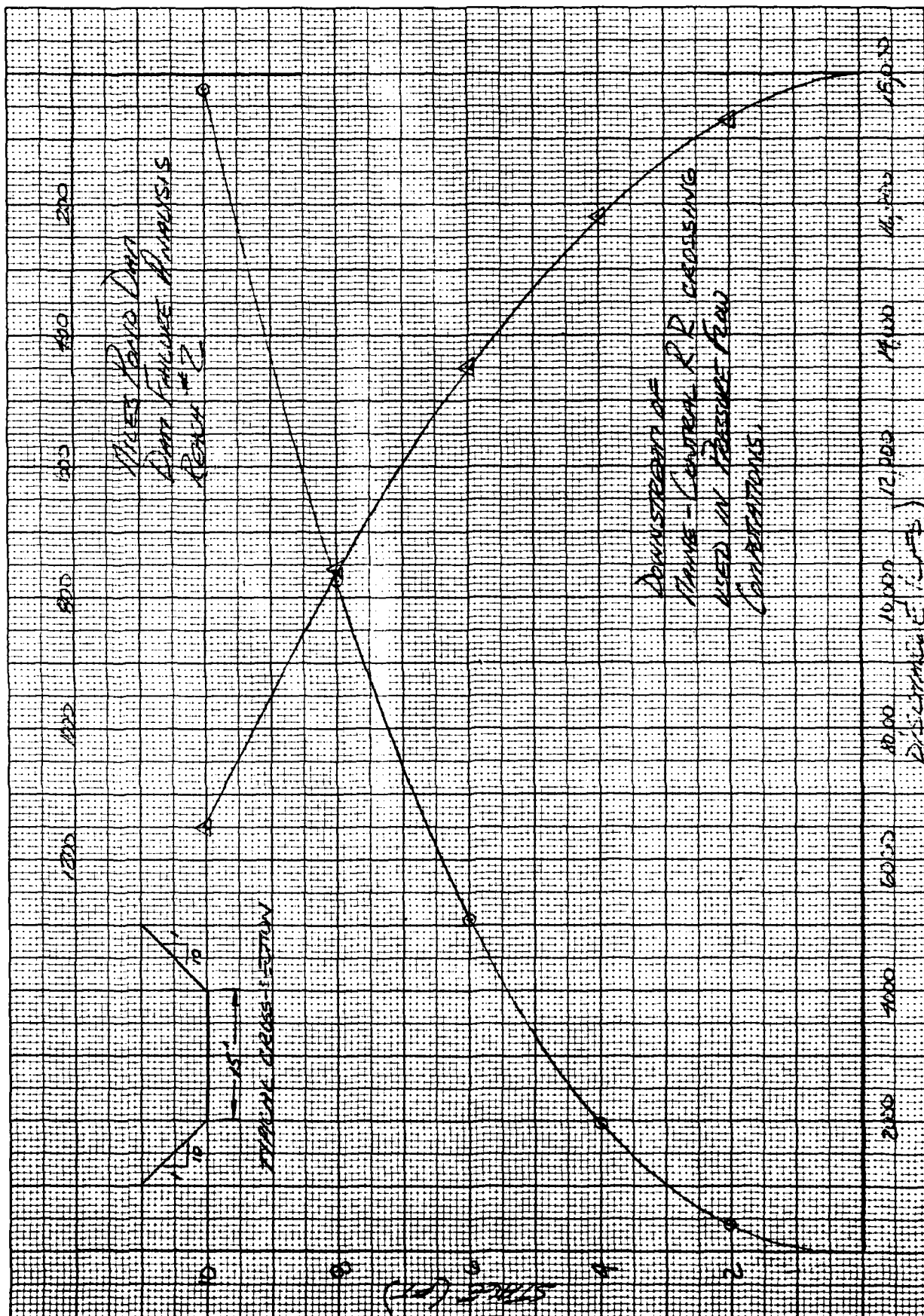
WEIR FLOW - $Q = CLH^{3/2}$ REACH #2

ASSUME $L = 500'$
 $C = 2.5$

| H | STAGE | Q | $\frac{1}{2}y + \text{STAGE}$ |
|---|-------|-------|-------------------------------|
| 1 | 16.8 | 1250 | 16.9 |
| 2 | 17.8 | 3536 | 17.9 |
| 3 | 18.8 | 6495 | 19.1 |
| 4 | 19.5 | 10000 | 20.2 |



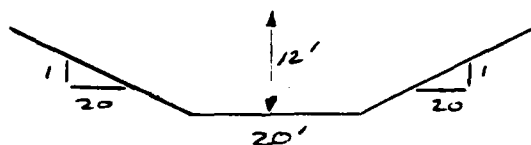




Job No. 7055 Sheet 22 of 30
 Project 11112 P.D. Dam Date 10-22-80
 Subject HYDRAULICS - HYDROLOGY By SL Ch'k. by

DAM FAILURE ANALYSIS (cont)

REACH #3



REACH LENGTH = 6000 FT
 SLOPE = 0.0036
 COMPOSITE "n" = (SMOOTH REACH) = 0.08

$$Q = \frac{1.49}{0.08} AR^{2/3} (0.0036)^{1/2}$$

$$Q = 1.12 AR^{2/3}$$

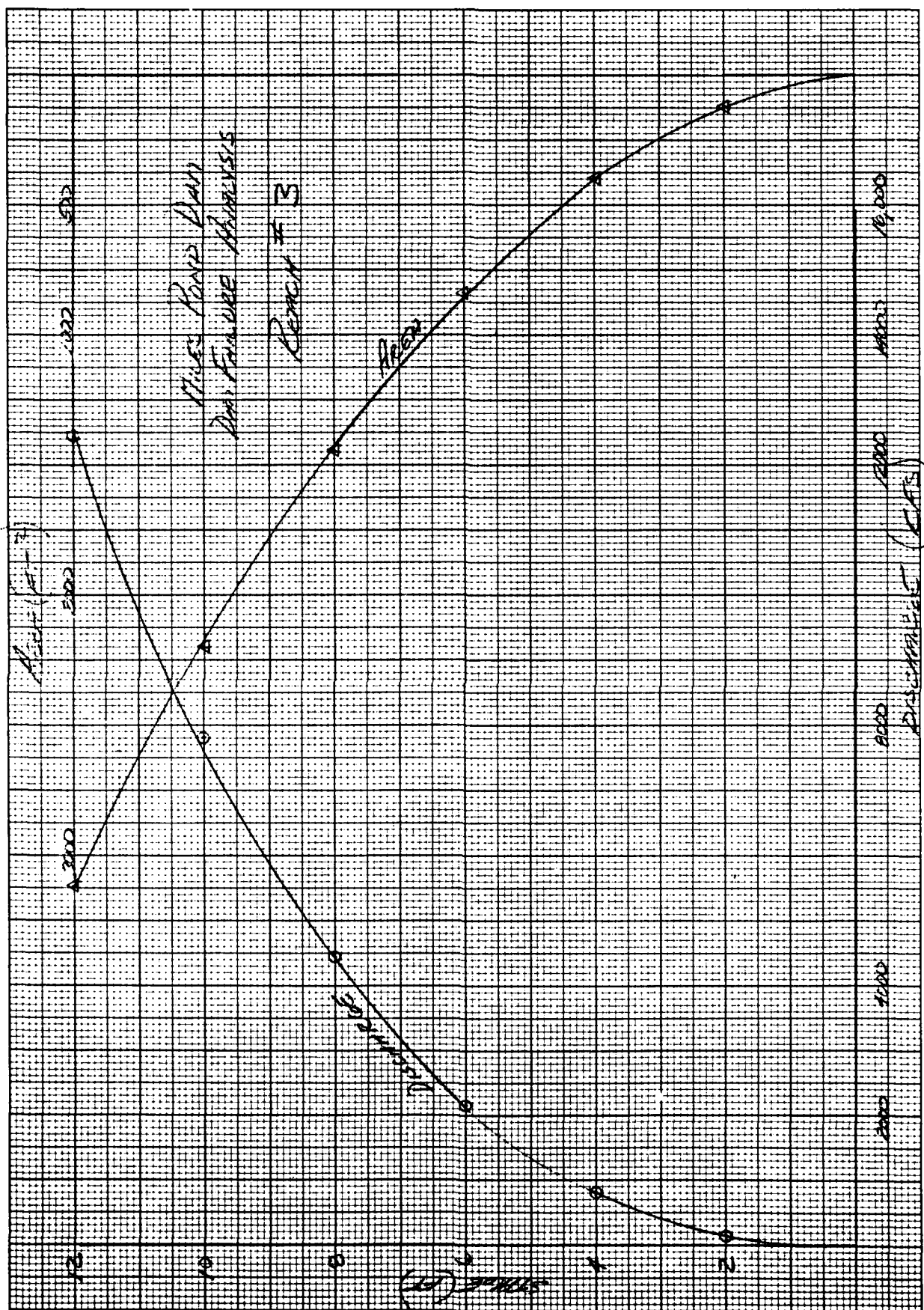
| DEPTH | R | $R^{2/3}$ | AREA | Q |
|-------|-------|-----------|------|-------|
| 2 | 100.0 | 1.13 | 120 | 160 |
| 4 | 150.2 | 1.70 | 400 | 801 |
| 6 | 200.2 | 2.18 | 840 | 2157 |
| 8 | 250.2 | 2.62 | 1440 | 4444 |
| 10 | 300.2 | 3.02 | 2200 | 7826 |
| 12 | 350.2 | 3.39 | 3120 | 12459 |

REACH #4 - MAINE CENTRAL RAILROAD BRIDGE
 ASSUME SAME AS REACH #2

REACH LENGTH = 1000'
 SLOPE = 0.0091
 COMPOSITE "n" = 0.055
 $Q = \frac{1.49}{0.055} AR^{2/3} (0.0091)^{1/2}$
 $Q = 2.58 AR^{2/3}$

| DEPTH | Q |
|-------|-----|
| 2 | 95 |
| 4 | 293 |
| 6 | 572 |
| 8 | 930 |
| 9.5 | 899 |

PRESSURE + WEIR FLOW ASSUMED
 SIMILAR TO REACH #2



Job No. 9CE55 Sheet 24 of 30
Project MILE-LEND DAM Date 11 24 80
Subject HYDRAULIC - HYDROLOGY By JK Ch'k. by _____

REACH #4

BACKWATER FROM MAINE-CENTRAL R.R. CROSSING.
INFORMATION FROM REACH #2 WAS USED TO APPROXIMATE
THE STAGE-DISCHARGE CURVE FOR THIS AREA.

Job No. 9655 Sheet 25 of 30
 Project 1166 Pond Dam Date 10-23-80
 Subject HYDRAULICS - HYDROLOGY By JK Ch'k. by

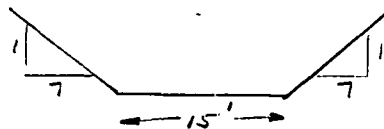
DAM FAILURE ANALYSIS (CON'T)

Run #5

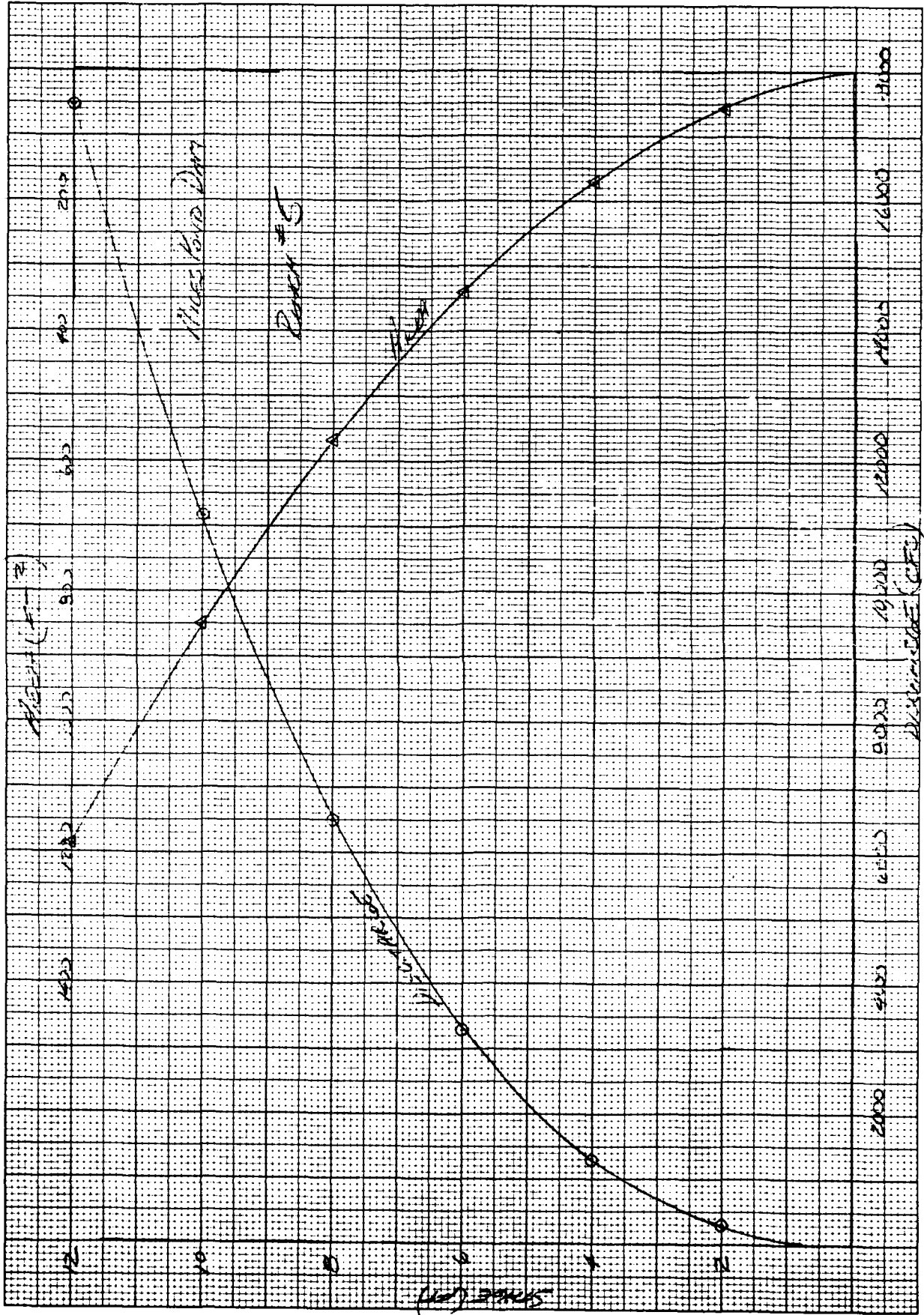
Run Length = 3200'
 Slope = 0.013
 Composite "n" = 0.04

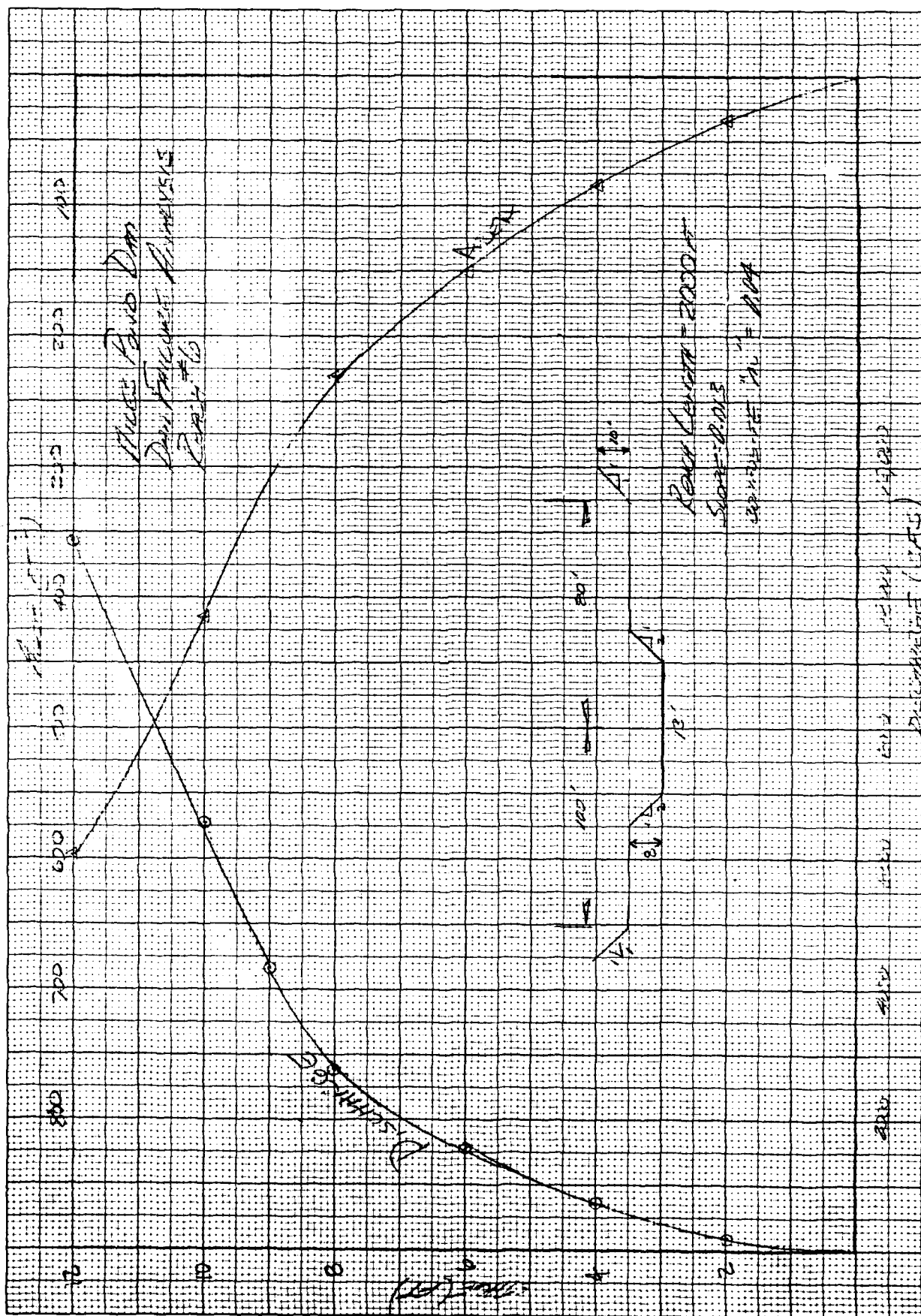
$$Q = \frac{1.49}{0.04} AR^{2/3} (0.013)^{1/2}$$

$$Q = 4.25 AR^{2/3}$$



| DEPTH | P ₀ | R ^{2/3} | AREA | Q |
|-------|----------------|------------------|------|-------|
| 2 | 42.2 | 1.22 | 58 | 301 |
| 4 | 71.6 | 1.79 | 172 | 1312 |
| 6 | 99.9 | 2.27 | 342 | 3299 |
| 8 | 128.1 | 2.69 | 568 | 6494 |
| 10 | 156.4 | 3.09 | 850 | 11163 |
| 12 | 184.7 | 3.46 | 1188 | 17470 |
| 13 | 198.8 | 3.64 | 1278 | 21318 |





Job No. 9805

Project Three Pond Dam

Subject HYDRAULICS - HYDROLOGY

Sheet 28 of 30

Date 10-26-80

By CJK Ch'k. by

Reach #1 REACH LENGTH = 2000 FT

BRANCH $Q_{P1} = 11,350 \text{ CFS} \rightarrow \text{STAGE} = 6.1 \text{ FT.}$

$W_{\text{STAGE AT 6.1 FT}} \rightarrow \text{AREA} = 2600 \text{ FT}^2 \rightarrow \text{VOLUME} = 1,179 \text{ MC-FT}$

BRANCH $Q_{P2} (\text{TRIAL}) = 11350 \left(1 - \frac{179}{2199}\right) = 10,426 \text{ CFS} \rightarrow \text{STAGE} = 5.85 \text{ FT}$

$W_{\text{STAGE AT 5.85 FT}} \rightarrow \text{AREA} = 2415 \rightarrow \text{VOLUME} = 166 \text{ MC-FT}$

BRANCH $Q_{P2} = 11350 \left(1 - \frac{179 + 166/2}{2199}\right) = 10460 \text{ CFS}$

STAGE IN REACH #1 = 5.85 FT.

Reach #2

REACH LENGTH = 550 FEET.

BRANCH $Q_{P1} = 10460 \text{ CFS} \rightarrow \text{STAGE} = 19.1 \text{ FT}$

$W_{\text{STAGE AT 19.1 FT}} \rightarrow \text{AREA} = 3938 \text{ FT}^2 \rightarrow \text{VOLUME} = 25 \text{ MC-FT}$

BRANCH $Q_{P2} (\text{TRIAL}) = 10460 \left(1 - \frac{25}{2199}\right) = 10341 \text{ CFS} \rightarrow \text{STAGE} = 19.0 \text{ FT}$

$W_{\text{STAGE AT 19.0 FT}} \rightarrow \text{AREA} = 3900 \text{ FT}^2 \rightarrow \text{VOLUME} = 25 \text{ MC-FT}$

BRANCH $Q_{P2} = 10460 \left(1 - \frac{25 + 25/2}{2199}\right) = 10341 \text{ CFS}$

STAGE IN REACH #2 = 19.0 FT

Reach #3

REACH LENGTH = 6000 FT

BRANCH $Q_{P3} = 10460 \rightarrow \text{STAGE} = 11.3 \text{ FT}$

$W_{\text{STAGE AT 11.3 FT}} \rightarrow \text{AREA} = 2762 \text{ FT}^2 \rightarrow \text{VOLUME} = 380 \text{ MC-FT}$

BRANCH $Q_{P4} (\text{TRIAL}) = 10460 \left(1 - \frac{380}{2199}\right) = 8652 \text{ CFS} \rightarrow \text{STAGE} = 10.5 \text{ FT}$

$W_{\text{STAGE AT 10.5 FT}} \rightarrow \text{AREA} = 2387 \text{ FT}^2 \rightarrow \text{VOLUME} = 320 \text{ MC-FT}$

BRANCH $Q_{P4} = 10460 \left(1 - \frac{380 + 320/2}{2199}\right) = 8774 \text{ CFS}$

STAGE IN REACH #3 = 10.6 FT

Job No. 90-11 Sheet 29 of 30
 Project Miss Pond Dam Date 10-26-90
 Subject HYDRAULICS - HYDROLOGY By JK Ch'k. by

Reach #4
 Reach Length = 525 FT

$$Q_{P4} = 8774 \text{ cfs} \rightarrow \text{Stage } 18.5 \text{ FT}$$

$$W/\text{Stage at } 18.5 \text{ FT} \rightarrow \text{Area} = 3700 \text{ FT}^2 \rightarrow \text{Volume} = 22 \text{ AC-FT}$$

$$\text{Branch } Q_{P5} (\text{TRIAL}) = 8774 \left(1 - \frac{22}{2199}\right) = 8686 \text{ cfs} \rightarrow \text{Stage} = 18.5 \text{ FT}$$

$$W/\text{Stage at } 18.5 \text{ FT} \rightarrow 3700 \text{ FT}^2 \rightarrow 22 \text{ AC-FT}$$

$$\text{Branch } Q_{P5} = 8774 \left(1 - \frac{22 + 22/2}{2199}\right) = 8686 \text{ cfs}$$

$$\text{Stage in Reach \#4} = 18.5 \text{ FT}$$

Reach #5
 Reach Length = 3200 FT

$$\text{Branch } Q_{P5} = 8686 \text{ cfs} \rightarrow \text{Stage } 9 \text{ FT}$$

$$W/\text{Stage at } 9 \text{ FT} \rightarrow \text{Area} = 705 \text{ FT}^2 \rightarrow \text{Volume} = 52 \text{ AC-FT}$$

$$\text{Branch } Q_{P6} (\text{TRIAL}) = 8686 \left(1 - \frac{52}{2199}\right) = 8481 \text{ cfs} \rightarrow \text{Stage } 8.9 \text{ FT}$$

$$W/\text{Stage at } 8.9 \text{ FT} \rightarrow \text{Area} = 690 \text{ FT}^2 \rightarrow \text{Volume } 51 \text{ AC-FT}$$

$$\text{Branch } Q_{P6} = 8686 \left(1 - \frac{52 + 51/2}{2199}\right) = 8483 \text{ cfs}$$

$$\text{Stage in Reach \#5} = 8.9 \text{ FT}$$

Reach #6
 Reach Length = 2000 FT

$$\text{Branch } Q_{P6} = 8483 \rightarrow \text{Stage } 10.9 \text{ FT}$$

$$W/\text{Stage at } 10.9 \text{ FT} \rightarrow \text{Area} = 510 \text{ FT}^2 \rightarrow \text{Volume} = 23 \text{ AC-FT}$$

$$\text{Branch } Q_{P7} (\text{TRIAL}) = 8483 \left(1 - \frac{23}{2199}\right) = 8394 \text{ cfs} \rightarrow \text{Stage} = 10.9 \text{ FT}$$

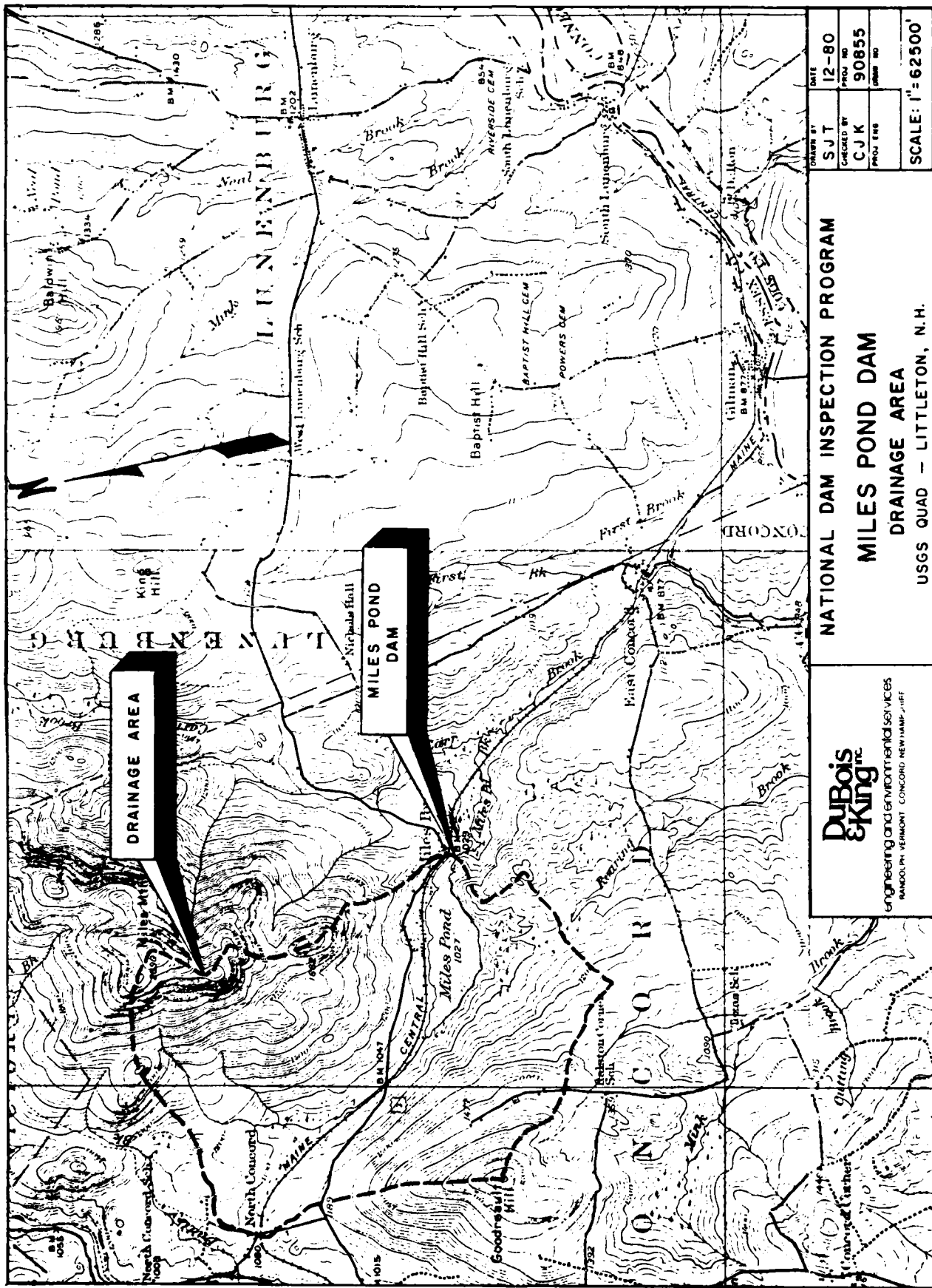
$$W/\text{Stage at } 10.9 \text{ FT} \rightarrow \text{Area} = 510 \text{ FT}^2 \rightarrow \text{Volume} = 22 \text{ AC-FT}$$

$$\text{Branch } Q_{P7} = 8483 \left(1 - \frac{23 + 22/2}{2199}\right) = 8394 \text{ cfs}$$

$$\text{Stage in Reach \#6} = 10.9 \text{ FT}$$

Job No. 90555Sheet 30 of 30Project MIKE POND DAMDate 10-24-80Subject HYDRAULICS - HYDROLOGYBy STK Ch'k. by _____DAM FAILURE ANALYSIS (CON'T)CONCLUSIONS

| REACH | DISCHARGE (CFS) | STAGE (FT) | COMMENTS | STAGE PRIOR TO FLOOD WAVE (FT) |
|--|--------------------|---------------|--|--------------------------------------|
| AT DAM WHEN FAILURE OCCURS | 11,350 | 10.4 | WATER LEVEL IN POND IS AT 102.4, TOP OF DAM, PRIOR TO FAILURE | |
| REACH #1 - BETWEEN CR 300 FT DOWNSTREAM OF DAM | 10,460 | 5.9 | NO STRUCTURES INUNDATED | 3.3 |
| REACH #2 | 10,341 | 19 | BACKWATER FROM R.R. BRIDGE. R.R. BRIDGE OVERTOPPED BY 3 FEET. R.R. USED FOR FREIGHT, ONLY | 11.7 |
| REACH #3 | 8774 | 10.6 | NO STRUCTURES INUNDATED | 7.1 |
| REACH #4 | 8686 | 18.5 | BACKWATER FROM R.R. BRIDGE. R.R. BRIDGE OVERTOPPED BY <u>~ 3 FT</u> R.R. USED FOR FREIGHT, ONLY | 11.7 |
| REACH #5 | 8483 | 8.9 | | 5.0 |
| REACH #6 | 8394 | 10.9 | 6 TO 10 STRUCTURES MAY BE INUNDATED APPROX. (4) USED FOR HUMAN HABITATION | 7.2 |



DuBois & King, Inc.

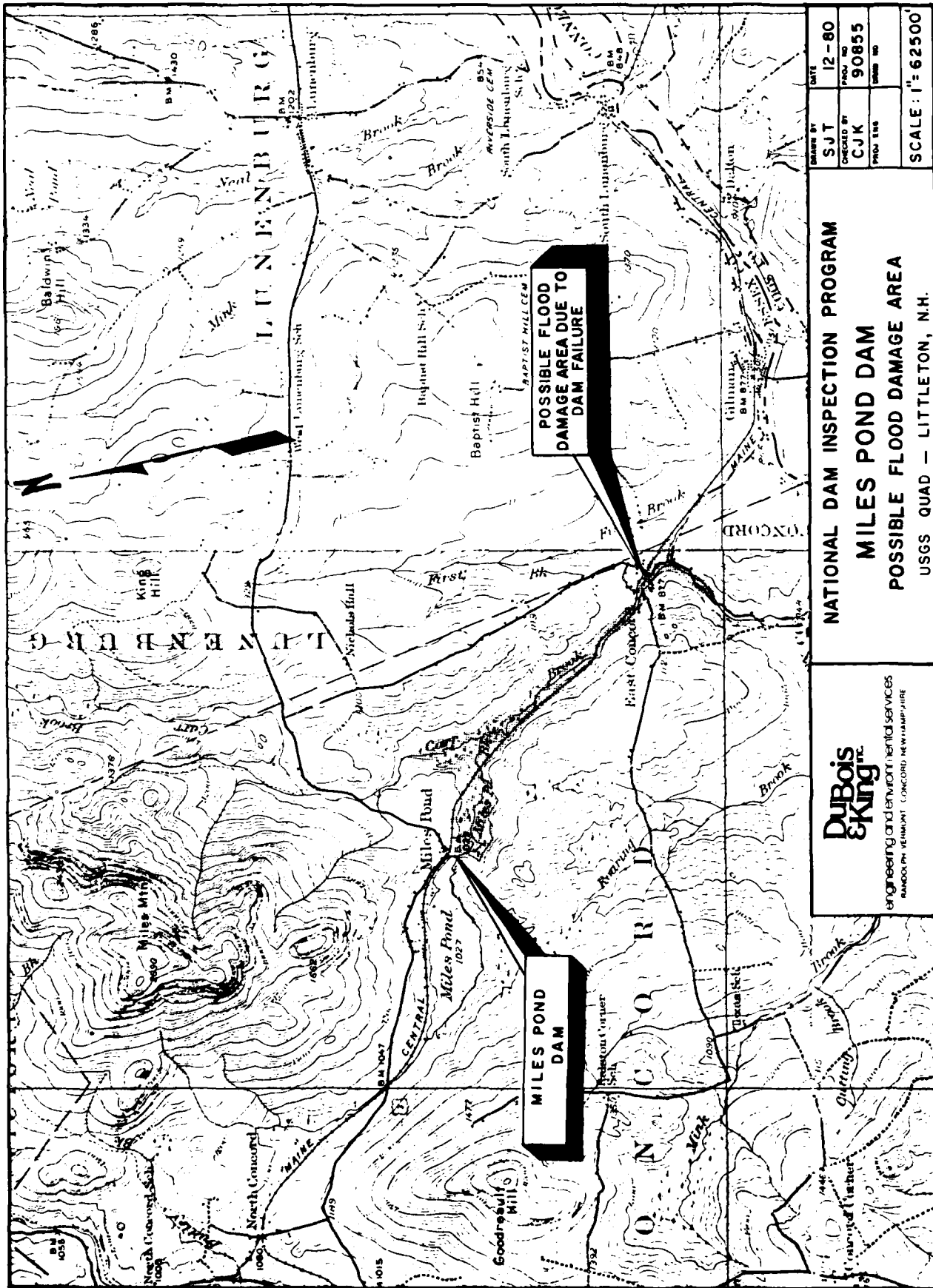
engineering and environmental services
RANDOLPH VERMONT CONCORD NEW HAMPSHIRE

NATIONAL DAM INSPECTION PROGRAM

**MILES POND DAM
DRAINAGE AREA**

USGS QUAD - LITTLETON, N.H.

| | |
|------------|-----------|
| DATE | 12-80 |
| DRAWN BY | SJT |
| CHECKED BY | CJK |
| PROJ NO | 90855 |
| DRAW NO | |
| SCALE: | 1"=62500' |



 REC-1 VERSION DATED JAN 1973
 UPDATED AUG 74
 CHANGE NO. 01

MILES POND DAM U.S. ARMY CORPS OF ENGINEERS
 CONCORD, VERMONT 1440
 DESIGN STORM

JCR SPECIFICATION
 NO NHR NMN IDAY IFM IMIN METRC IPLT IPRT NSTAN
 144 0 10 1 0 0 3 2 0 0
 JOPEH NMJ
 3 0

 SUB-AREA RUNOFF COMPUTATION

MILES POND DAM
 ISTAT 1 ICOMP 0 IECON 0 ITAPE 0 JPLT 1 JPRT 0 INAME 1
 IHYDG 1 IUHG 1 TARFA 5.70 SNAP 0.00 HYDROGRAPH DATA
 THSCA THSPC HATIC ISNOW 0 ISAME 0 LOCAL 0
 0.00 19.50 100.00 111.00 120.00 0.00 0.00 0.00
 PRECIP DATA
 R12 J24 R48 R72 R96
 0.00 19.50 100.00 111.00 120.00 0.00 0.00 0.00
 LOSS DATA
 STPKS RTIOK STRTL CNSTL ALSMX RTIMP
 0.00 0.00 1.00 0.00 1.00 0.74 0.12 0.00 0.00
 UNIT HYDROGRAPH DATA
 TP= 3.50 CP= .43 NTA= 0
 RECESSION DATA
 STARTQ= 4.00 CRCSN= 1.10 RTICH= 1.50
 * APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 7.36 AND H= 6.22 INTERVALS

UNIT HYDROGRAPH 38 END-OF-PERIOD ORDNATES. LAG= 3.47 HOURS. CP= .64 VOL= 1.00
 41. 152. 302. 470. 629. 744. 800. 786. 702. 544.
 504. 433. 364. 314. 267. 227. 193. 165. 140. 119.
 102. 86. 74. 63. 53. 45. 39. 33. 28. 24.
 20. 17. 15. 13. 11. 9. 7. 5. 4. 3.

END-OF-PERIOD FLOW
 TIME RAIN EXCS FLOW COMP Q
 1 0 30 .06 0.00 4.
 1 1 30 .06 0.00 4.
 1 2 30 .06 0.00 4.
 1 3 30 .06 0.00 3.
 1 4 30 .06 0.00 3.
 1 5 30 .06 0.00 3.
 1 6 30 .06 0.00 3.
 1 7 30 .06 0.00 3.
 1 8 30 .06 0.00 3.
 1 9 30 .06 0.00 3.
 1 10 30 .06 0.00 3.
 1 11 30 .06 0.00 3.
 1 12 30 .06 0.00 3.
 1 13 30 .06 0.00 3.
 1 14 30 .06 0.00 3.
 1 15 30 .06 0.00 3.
 1 16 30 .06 0.00 3.
 1 17 30 .06 0.00 3.
 1 18 30 .06 0.00 3.
 1 19 30 .06 0.00 3.
 1 20 30 .06 0.00 3.
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 1 22 30 .06 0.00 3.
 1 23 30 .06 0.00 3.
 1 24 30 .06 0.00 3.
 1 25 30 .06 0.00 3.
 1 26 30 .06 0.00 3.
 1 27 30 .06 0.00 3.
 1 28 30 .06 0.00 3.
 1 29 30 .06 0.00 3.
 1 30 30 .06 0.00 3.
 1 31 30 .06 0.00 3.
 1 32 30 .06 0.00 3.
 1 33 30 .06 0.00 3.
 1 34 30 .06 0.00 3.
 1 35 30 .06 0.00 3.
 1 36 30 .06 0.00 3.
 1 37 30 .06 0.00 3.
 1 38 30 .06 0.00 3.
 1 39 30 .06 0.00 3.
 1 40 30 .06 0.00 3.
 1 41 30 .06 0.00 3.
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 1 55 30 .06 0.00 3.
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 1 95 30 .06 0.00 3.
 1 96 30 .06 0.00 3.
 1 97 30 .06 0.00 3.
 1 98 30 .06 0.00 3.
 1 99 30 .06 0.00 3.
 1 100 30 .06 0.00 3.

| | | | | |
|----|------|----|----|-------|
| 1 | 30 | 37 | 31 | 6733 |
| 2 | 30 | 37 | 31 | 6740 |
| 3 | 30 | 07 | 01 | 6747 |
| 4 | 30 | 09 | 03 | 10449 |
| 5 | 30 | 09 | 03 | 11744 |
| 6 | 30 | 09 | 03 | 12034 |
| 7 | 30 | 09 | 03 | 16946 |
| 8 | 30 | 09 | 03 | 16946 |
| 9 | 30 | 09 | 03 | 16946 |
| 10 | 30 | 09 | 03 | 16946 |
| 11 | 30 | 09 | 03 | 16946 |
| 12 | 30 | 09 | 03 | 16946 |
| 13 | 30 | 09 | 03 | 16946 |
| 14 | 30 | 09 | 03 | 16946 |
| 15 | 30 | 09 | 03 | 16946 |
| 16 | 30 | 09 | 03 | 16946 |
| 17 | 30 | 09 | 03 | 16946 |
| 18 | 30 | 09 | 03 | 16946 |
| 19 | 30 | 09 | 03 | 16946 |
| 20 | 30 | 09 | 03 | 16946 |
| 21 | 30 | 09 | 03 | 16946 |
| 22 | 30 | 09 | 03 | 16946 |
| 23 | 30 | 09 | 03 | 16946 |
| 24 | 30 | 09 | 03 | 16946 |
| 25 | 30 | 09 | 03 | 16946 |
| 26 | 30 | 09 | 03 | 16946 |
| 27 | 30 | 09 | 03 | 16946 |
| 28 | 30 | 09 | 03 | 16946 |
| 29 | 30 | 09 | 03 | 16946 |
| 30 | 30 | 09 | 03 | 16946 |
| 31 | 30 | 09 | 03 | 16946 |
| 32 | 30 | 09 | 03 | 16946 |
| 33 | 30 | 09 | 03 | 16946 |
| 34 | 30 | 09 | 03 | 16946 |
| 35 | 30 | 09 | 03 | 16946 |
| 36 | 30 | 09 | 03 | 16946 |
| 37 | 30 | 09 | 03 | 16946 |
| 38 | 30 | 09 | 03 | 16946 |
| 39 | 30 | 09 | 03 | 16946 |
| 40 | 30 | 09 | 03 | 16946 |
| 41 | 30 | 09 | 03 | 16946 |
| 42 | 30 | 09 | 03 | 16946 |
| 43 | 30 | 09 | 03 | 16946 |
| 44 | 30 | 09 | 03 | 16946 |
| 45 | 30 | 09 | 03 | 16946 |
| 46 | 30 | 09 | 03 | 16946 |
| 47 | 30 | 09 | 03 | 16946 |
| 48 | 30 | 09 | 03 | 16946 |
| 49 | 30 | 09 | 03 | 16946 |
| 50 | 30 | 09 | 03 | 16946 |
| 51 | 30 | 09 | 03 | 16946 |
| 52 | 30 | 09 | 03 | 16946 |
| 53 | 30 | 09 | 03 | 16946 |
| 54 | 30 | 09 | 03 | 16946 |
| 55 | 30 | 09 | 03 | 16946 |
| 56 | 30 | 09 | 03 | 16946 |
| 57 | 30 | 09 | 03 | 16946 |
| 58 | 30 | 09 | 03 | 16946 |
| 59 | 30 | 09 | 03 | 16946 |
| 60 | 30 | 09 | 03 | 16946 |
| 61 | 30 | 09 | 03 | 16946 |
| 62 | 30 | 09 | 03 | 16946 |
| 63 | 30 | 09 | 03 | 16946 |
| 64 | 30 | 09 | 03 | 16946 |
| 65 | 30 | 09 | 03 | 16946 |
| 66 | 30 | 09 | 03 | 16946 |
| 67 | 30 | 09 | 03 | 16946 |
| 68 | 30 | 09 | 03 | 16946 |
| 69 | 30 | 09 | 03 | 16946 |
| 70 | 30 | 09 | 03 | 16946 |
| 71 | 30 | 09 | 03 | 16946 |
| 72 | 30 | 09 | 03 | 16946 |
| 73 | 30 | 09 | 03 | 16946 |
| 74 | 30 | 09 | 03 | 16946 |
| 75 | 30 | 09 | 03 | 16946 |
| 76 | 30 | 09 | 03 | 16946 |
| 77 | 30 | 09 | 03 | 16946 |
| 78 | 30 | 09 | 03 | 16946 |
| 79 | 30 | 09 | 03 | 16946 |
| 80 | 30 | 09 | 03 | 16946 |
| 81 | 30 | 09 | 03 | 16946 |
| 82 | 30 | 09 | 03 | 16946 |
| 83 | 30 | 09 | 03 | 16946 |
| 84 | 30 | 09 | 03 | 16946 |
| 85 | 30 | 09 | 03 | 16946 |
| 86 | 30 | 09 | 03 | 16946 |
| 87 | 30 | 09 | 03 | 16946 |
| 88 | 30 | 09 | 03 | 16946 |
| 89 | 30 | 09 | 03 | 16946 |
| 90 | 30 | 09 | 03 | 16946 |
| 91 | 30 | 09 | 03 | 16946 |
| 92 | 30 | 09 | 03 | 16946 |
| 93 | 30 | 09 | 03 | 16946 |
| 94 | 30 | 09 | 03 | 16946 |
| 95 | 30 | 09 | 03 | 16946 |
| 96 | 30</ | | | |

| | | | | | |
|---|----|----|------|------|-----|
| 3 | 12 | 30 | 0.00 | 0.00 | 83. |
| 3 | 12 | 60 | 0.00 | 0.00 | 80. |
| 3 | 13 | 30 | 0.00 | 0.00 | 77. |
| 3 | 13 | 60 | 0.00 | 0.00 | 74. |
| 3 | 14 | 30 | 0.00 | 0.00 | 71. |
| 3 | 14 | 60 | 0.00 | 0.00 | 68. |
| 3 | 15 | 30 | 0.00 | 0.00 | 65. |
| 3 | 15 | 60 | 0.00 | 0.00 | 62. |
| 3 | 16 | 30 | 0.00 | 0.00 | 59. |
| 3 | 16 | 60 | 0.00 | 0.00 | 56. |
| 3 | 17 | 30 | 0.00 | 0.00 | 53. |
| 3 | 17 | 60 | 0.00 | 0.00 | 50. |
| 3 | 18 | 30 | 0.00 | 0.00 | 47. |
| 3 | 18 | 60 | 0.00 | 0.00 | 44. |
| 3 | 19 | 30 | 0.00 | 0.00 | 41. |
| 3 | 19 | 60 | 0.00 | 0.00 | 38. |
| 3 | 20 | 30 | 0.00 | 0.00 | 35. |
| 3 | 20 | 60 | 0.00 | 0.00 | 32. |
| 3 | 21 | 30 | 0.00 | 0.00 | 29. |
| 3 | 21 | 60 | 0.00 | 0.00 | 26. |
| 3 | 22 | 30 | 0.00 | 0.00 | 23. |
| 3 | 22 | 60 | 0.00 | 0.00 | 20. |
| 3 | 23 | 30 | 0.00 | 0.00 | 17. |
| 3 | 23 | 60 | 0.00 | 0.00 | 14. |

SUM 23.42 20.51 198743.

| | PHAR | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|--------|--------|--------|---------|---------|--------------|
| CFS | 12035. | 9575. | 3772. | 1380. | 198779. |
| INC-FS | | 13.24 | 20.95 | 23.00 | 23.00 |
| AC-FT | | 4750. | 7486. | 8218. | 8218. |

HYDROGRAPH ROUTING

RESERVOIR ROUTING--MILES POND DAM
 ISTAR 0 ICOMP 1 IECON 0 ITAPE 0 JPLT 0 JPRT 0 INAME 1
 ROUTING DATA
 GLOSS 0.0 CLOSS 0.000 AVG IRES 1 ISAME 0
 NSTPS 1 NSTOL 0 LAG 0 ANSKK 0.000 0.000 0.000 0.000
 STORA -1.

| | | | | | | | | | | |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|
| STORACE= | 1367. | 1500. | 1715. | 1925. | 2199. | 2350. | 2560. | 2775. | 2990. | 3200. |
| OUTFLC= | 0. | 11. | 363. | 988. | 2159. | 3109. | 5403. | 8284. | 11636. | 15392. |

| TIME | EOP STOR | AVG IN | EOP OUT |
|---------|----------|--------|---------|
| 1 0 30 | 1413. | 4. | 4. |
| 1 0 60 | 1413. | 4. | 4. |
| 1 1 30 | 1413. | 4. | 4. |
| 1 1 60 | 1413. | 3. | 4. |
| 1 2 30 | 1413. | 3. | 4. |
| 1 2 60 | 1413. | 3. | 4. |
| 1 3 30 | 1413. | 3. | 4. |
| 1 3 60 | 1413. | 3. | 4. |
| 1 4 30 | 1413. | 3. | 4. |
| 1 4 60 | 1413. | 3. | 4. |
| 1 5 30 | 1413. | 3. | 4. |
| 1 5 60 | 1413. | 4. | 4. |
| 1 6 30 | 1414. | 14. | 4. |
| 1 6 60 | 1415. | 37. | 4. |
| 1 7 30 | 1418. | 79. | 4. |
| 1 7 60 | 1424. | 140. | 5. |
| 1 8 30 | 1432. | 218. | 5. |
| 1 8 60 | 1445. | 388. | 6. |
| 1 9 30 | 1461. | 401. | 8. |
| 1 9 60 | 1481. | 491. | 9. |
| 1 10 30 | 1504. | 570. | 19. |
| 1 10 60 | 1524. | 638. | 58. |
| 1 11 30 | 1554. | 698. | 100. |
| 1 11 60 | 1581. | 742. | 143. |
| 1 12 30 | 1610. | 771. | 192. |
| 1 12 60 | 1647. | 1101. | 251. |
| 1 13 30 | 1685. | 1455. | 330. |
| 1 13 60 | 1729. | 1972. | 495. |
| 1 14 30 | 1787. | 2468. | 744. |
| 1 14 60 | 1850. | 2937. | 1093. |
| 1 15 30 | 1918. | 3388. | 1463. |
| 1 15 60 | 1991. | 3828. | 1950. |
| 1 16 30 | 2068. | 4211. | 2453. |
| 1 16 60 | 2150. | 4537. | 2977. |
| 1 17 30 | 2237. | 4808. | 3522. |

| | | | | |
|-----|----|------|--------|-----|
| 14 | 30 | 1521 | 72 | 145 |
| 14 | 60 | 1576 | 64 | 140 |
| 15 | 30 | 1576 | 67 | 133 |
| 15 | 60 | 1573 | 64 | 133 |
| 16 | 30 | 1570 | 61 | 125 |
| 16 | 60 | 1568 | 57 | 118 |
| 17 | 30 | 1563 | 54 | 111 |
| 17 | 60 | 1560 | 52 | 109 |
| 18 | 30 | 1555 | 50 | 106 |
| 18 | 60 | 1553 | 48 | 102 |
| 19 | 30 | 1551 | 46 | 100 |
| 19 | 60 | 1551 | 44 | 98 |
| 20 | 30 | 1546 | 43 | 97 |
| 20 | 60 | 1547 | 41 | 88 |
| 21 | 30 | 1545 | 34 | 85 |
| 21 | 60 | 1543 | 38 | 82 |
| 22 | 30 | 1541 | 36 | 79 |
| 22 | 60 | 1540 | 35 | 76 |
| 23 | 30 | 1538 | 33 | 73 |
| SUM | | | 195788 | |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|--------|--------|--------|---------|---------|--------------|
| CFS | 11273. | 9019. | 3664. | 1360. | 195788. |
| INCHES | | 12.5 | 20.35 | 22.65 | 22.65 |
| AC-FT | | 4475. | 7272. | 8095. | 8095. |

RUNOFF SUMMARY: AVERAGE FLOW

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | AREA | |
|---------------|------|--------|---------|---------|-------|------|
| HYDROGRAPH AT | 1 | 12035. | 9575. | 3772. | 1380. | 6.70 |
| ROUTED TO | 2 | 11273. | 4019. | 3664. | 1360. | 6.70 |

 MEC-1 VERSION DATED JAN 1973
 UPDATED AUG 74
 CHANGE NO. 01

MILES POND DAM U.S. ARMY CORPS OF ENGINEERS
 CONCORD, VERMONT 1980
 DESIGN STORM

JOB SPECIFICATION
 NO NFR NMIN IDAY IFR IMIN METHC IPLT IPRT NSTAN
 144 0 30 1 0 0 0 2 0 0
 JCPER 3 NWT 0

 SUB-AREA RUNOFF COMPUTATION

| MILES POND DAM | | ICOMP | IECON | ITAPE | JPLT | JPRT | INAME | |
|----------------|---|-------|-------|-------|------|------|-------|--|
| ISTAQ | 1 | 0 | 0 | 0 | 1 | 0 | 1 | |
| IMYUG | 1 | IUMG | 1 | TAREA | 6.70 | SNAP | 0.00 | HYDROGRAPH DATA |
| | | | | | | | | TRSDA TRSPC RATIO ISNOW ISAME LOCAL |
| | | | | | | | | 0.00 1.00 .500 0 0 |
| | | | | | | | | PRECIP DATA |
| | | | | | | | | R12 R24 R48 R72 R96 |
| | | | | | | | | 0.00 19.50 100.00 111.00 120.00 0.00 0.00 0.00 |
| | | | | | | | | LOSS DATA |
| | | | | | | | | STHKS RTIOK STMTL CNSTL ALSMX RTIMP |
| | | | | | | | | 0.00 0.00 1.00 .74 .12 0.00 0.00 |

UNIT HYDROGRAPH DATA
 TP= 3.50 CP= .63 NTA= 0

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 7.86 AND R= 6.22 INTERVALS
 RECESION DATA
 STNTO= 4.00 ORCSN= -10 RTICR= 1.50
 RTICR= 1.50

UNIT HYDROGRAPH 38 END-OF-PERIOD ORDINATES, LAG= 3.47 HOURS, CP= .64 VOL= 1.00
 41. 152. 302. 470. 629. 744. 800. 786. 702. 598.
 509. 433. 369. 314. 267. 227. 193. 165. 140. 119.
 102. 74. 63. 53. 45. 39. 33. 28. 24.
 20. 17. 15. 13. 11. 9. 8. 7.

| TIME | RAIN | EXCS | COMP Q |
|-------|------|------|--------|
| 0 30 | .06 | 0.00 | 4. |
| 1 00 | .06 | 0.00 | 4. |
| 1 30 | .06 | 0.00 | 4. |
| 1 45 | .06 | 0.00 | 3. |
| 1 50 | .06 | 0.00 | 3. |
| 1 55 | .06 | 0.00 | 3. |
| 2 00 | .06 | 0.00 | 3. |
| 2 15 | .06 | 0.00 | 3. |
| 2 30 | .06 | 0.00 | 3. |
| 2 45 | .06 | 0.00 | 3. |
| 2 50 | .06 | 0.00 | 3. |
| 2 55 | .06 | 0.00 | 3. |
| 3 00 | .06 | 0.00 | 3. |
| 3 15 | .06 | 0.00 | 3. |
| 3 30 | .06 | 0.00 | 3. |
| 3 45 | .06 | 0.00 | 3. |
| 3 50 | .06 | 0.00 | 3. |
| 3 55 | .06 | 0.00 | 3. |
| 4 00 | .06 | 0.00 | 3. |
| 4 15 | .06 | 0.00 | 3. |
| 4 30 | .06 | 0.00 | 3. |
| 4 45 | .06 | 0.00 | 3. |
| 4 50 | .06 | 0.00 | 3. |
| 4 55 | .06 | 0.00 | 3. |
| 5 00 | .06 | 0.00 | 3. |
| 5 15 | .06 | 0.00 | 3. |
| 5 30 | .06 | 0.00 | 3. |
| 5 45 | .06 | 0.00 | 3. |
| 5 50 | .06 | 0.00 | 3. |
| 5 55 | .06 | 0.00 | 3. |
| 6 00 | .06 | 0.00 | 3. |
| 6 15 | .06 | 0.00 | 3. |
| 6 30 | .06 | 0.00 | 3. |
| 6 45 | .06 | 0.00 | 3. |
| 6 50 | .06 | 0.00 | 3. |
| 6 55 | .06 | 0.00 | 3. |
| 7 00 | .06 | 0.00 | 3. |
| 7 15 | .06 | 0.00 | 3. |
| 7 30 | .06 | 0.00 | 3. |
| 7 45 | .06 | 0.00 | 3. |
| 7 50 | .06 | 0.00 | 3. |
| 7 55 | .06 | 0.00 | 3. |
| 8 00 | .06 | 0.00 | 3. |
| 8 15 | .06 | 0.00 | 3. |
| 8 30 | .06 | 0.00 | 3. |
| 8 45 | .06 | 0.00 | 3. |
| 8 50 | .06 | 0.00 | 3. |
| 8 55 | .06 | 0.00 | 3. |
| 9 00 | .06 | 0.00 | 3. |
| 9 15 | .06 | 0.00 | 3. |
| 9 30 | .06 | 0.00 | 3. |
| 9 45 | .06 | 0.00 | 3. |
| 9 50 | .06 | 0.00 | 3. |
| 9 55 | .06 | 0.00 | 3. |
| 10 00 | .06 | 0.00 | 3. |
| 10 15 | .06 | 0.00 | 3. |
| 10 30 | .06 | 0.00 | 3. |
| 10 45 | .06 | 0.00 | 3. |
| 10 50 | .06 | 0.00 | 3. |
| 10 55 | .06 | 0.00 | 3. |
| 11 00 | .06 | 0.00 | 3. |
| 11 15 | .06 | 0.00 | 3. |
| 11 30 | .06 | 0.00 | 3. |
| 11 45 | .06 | 0.00 | 3. |
| 11 50 | .06 | 0.00 | 3. |
| 11 55 | .06 | 0.00 | 3. |
| 12 00 | .06 | 0.00 | 3. |
| 12 15 | .06 | 0.00 | 3. |
| 12 30 | .06 | 0.00 | 3. |
| 12 45 | .06 | 0.00 | 3. |
| 12 50 | .06 | 0.00 | 3. |
| 12 55 | .06 | 0.00 | 3. |
| 13 00 | .06 | 0.00 | 3. |
| 13 15 | .06 | 0.00 | 3. |
| 13 30 | .06 | 0.00 | 3. |
| 13 45 | .06 | 0.00 | 3. |
| 13 50 | .06 | 0.00 | 3. |
| 13 55 | .06 | 0.00 | 3. |
| 14 00 | .06 | 0.00 | 3. |
| 14 15 | .06 | 0.00 | 3. |
| 14 30 | .06 | 0.00 | 3. |
| 14 45 | .06 | 0.00 | 3. |
| 14 50 | .06 | 0.00 | 3. |
| 14 55 | .06 | 0.00 | 3. |
| 15 00 | .06 | 0.00 | 3. |
| 15 15 | .06 | 0.00 | 3. |
| 15 30 | .06 | 0.00 | 3. |
| 15 45 | .06 | 0.00 | 3. |
| 15 50 | .06 | 0.00 | 3. |
| 15 55 | .06 | 0.00 | 3. |
| 16 00 | .06 | 0.00 | 3. |
| 16 15 | .06 | 0.00 | 3. |
| 16 30 | .06 | 0.00 | 3. |
| 16 45 | .06 | 0.00 | 3. |
| 16 50 | .06 | 0.00 | 3. |
| 16 55 | .06 | 0.00 | 3. |
| 17 00 | .06 | 0.00 | 3. |
| 17 15 | .06 | 0.00 | 3. |
| 17 30 | .06 | 0.00 | 3. |
| 17 45 | .06 | 0.00 | 3. |
| 17 50 | .06 | 0.00 | 3. |
| 17 55 | .06 | 0.00 | 3. |
| 18 00 | .06 | 0.00 | 3. |
| 18 15 | .06 | 0.00 | 3. |
| 18 30 | .06 | 0.00 | 3. |
| 18 45 | .06 | 0.00 | 3. |
| 18 50 | .06 | 0.00 | 3. |
| 18 55 | .06 | 0.00 | 3. |
| 19 00 | .06 | 0.00 | 3. |
| 19 15 | .06 | 0.00 | 3. |
| 19 30 | .06 | 0.00 | 3. |
| 19 45 | .06 | 0.00 | 3. |
| 19 50 | .06 | 0.00 | 3. |
| 19 55 | .06 | 0.00 | 3. |
| 20 00 | .06 | 0.00 | 3. |
| 20 15 | .06 | 0.00 | 3. |
| 20 30 | .06 | 0.00 | 3. |
| 20 45 | .06 | 0.00 | 3. |
| 20 50 | .06 | 0.00 | 3. |
| 20 55 | .06 | 0.00 | 3. |
| 21 00 | .06 | 0.00 | 3. |
| 21 15 | .06 | 0.00 | 3. |
| 21 30 | .06 | 0.00 | 3. |
| 21 45 | .06 | 0.00 | 3. |
| 21 50 | .06 | 0.00 | 3. |
| 21 55 | .06 | 0.00 | 3. |
| 22 00 | .06 | 0.00 | 3. |
| 22 15 | .06 | 0.00 | 3. |
| 22 30 | .06 | 0.00 | 3. |
| 22 45 | .06 | 0.00 | 3. |
| 22 50 | .06 | 0.00 | 3. |
| 22 55 | .06 | 0.00 | 3. |
| 23 00 | .06 | 0.00 | 3. |
| 23 15 | .06 | 0.00 | 3. |
| 23 30 | .06 | 0.00 | 3. |
| 23 45 | .06 | 0.00 | 3. |
| 23 50 | .06 | 0.00 | 3. |
| 23 55 | .06 | 0.00 | 3. |
| 24 00 | .06 | 0.00 | 3. |
| 24 15 | .06 | 0.00 | 3. |
| 24 30 | .06 | 0.00 | 3. |
| 24 45 | .06 | 0.00 | 3. |
| 24 50 | .06 | 0.00 | 3. |
| 24 55 | .06 | 0.00 | 3. |
| 25 00 | .06 | 0.00 | 3. |
| 25 15 | .06 | 0.00 | 3. |
| 25 30 | .06 | 0.00 | 3. |
| 25 45 | .06 | 0.00 | 3. |
| 25 50 | .06 | 0.00 | 3. |
| 25 55 | .06 | 0.00 | 3. |
| 26 00 | .06 | 0.00 | 3. |
| 26 15 | .06 | 0.00 | 3. |
| 26 30 | .06 | 0.00 | 3. |
| 26 45 | .06 | 0.00 | 3. |
| 26 50 | .06 | 0.00 | 3. |
| 26 55 | .06 | 0.00 | 3. |
| 27 00 | .06 | 0.00 | 3. |
| 27 15 | .06 | 0.00 | 3. |
| 27 30 | .06 | 0.00 | 3. |
| 27 45 | .06 | 0.00 | 3. |
| 27 50 | .06 | 0.00 | 3. |
| 27 55 | .06 | 0.00 | 3. |
| 28 00 | .06 | 0.00 | 3. |
| 28 15 | .06 | 0.00 | 3. |
| 28 30 | .06 | 0.00 | 3. |
| 28 45 | .06 | 0.00 | 3. |
| 28 50 | .06 | 0.00 | 3. |
| 28 55 | .06 | 0.00 | 3. |
| 29 00 | .06 | 0.00 | 3. |
| 29 15 | .06 | 0.00 | 3. |
| 29 30 | .06 | 0.00 | 3. |
| 29 45 | .06 | 0.00 | 3. |
| 29 50 | .06 | 0.00 | 3. |
| 29 55 | .06 | 0.00 | 3. |
| 30 00 | .06 | 0.00 | 3. |
| 30 15 | .06 | 0.00 | 3. |
| 30 30 | .06 | 0.00 | 3. |
| 30 45 | .06 | 0.00 | 3. |
| 30 50 | .06 | 0.00 | 3. |
| 30 55 | .06 | 0.00 | 3. |
| 31 00 | .06 | 0.00 | 3. |
| 31 15 | .06 | 0.00 | 3. |
| 31 30 | .06 | 0.00 | 3. |
| 31 45 | .06 | 0.00 | 3. |
| 31 50 | .06 | 0.00 | 3. |
| 31 55 | .06 | 0.00 | 3. |
| 32 00 | .06 | 0.00 | 3. |
| 32 15 | .06 | 0.00 | 3. |
| 32 30 | .06 | 0.00 | 3. |
| 32 45 | .06 | 0.00 | 3. |
| 32 50 | .06 | 0.00 | 3. |
| 32 55 | .06 | 0.00 | 3. |
| 33 00 | .06 | 0.00 | 3. |
| 33 15 | .06 | 0.00 | 3. |
| 33 30 | .06 | 0.00 | 3. |
| 33 45 | .06 | 0.00 | 3. |
| 33 50 | .06 | 0.00 | 3. |
| 33 55 | .06 | 0.00 | 3. |
| 34 00 | .06 | 0.00 | 3. |
| 34 15 | .06 | 0.00 | 3. |
| 34 30 | .06 | 0.00 | 3. |
| 34 45 | .06 | 0.00 | 3. |
| 34 50 | .06 | 0.00 | 3. |
| 34 55 | .06 | 0.00 | 3. |
| 35 00 | .06 | 0.00 | 3. |
| 35 15 | .06 | 0.00 | 3. |
| 35 30 | .06 | 0.00 | 3. |
| 35 45 | .06 | 0.00 | 3. |
| 35 50 | .06 | 0.00 | 3. |
| 35 55 | .06 | 0.00 | 3. |
| 36 00 | .06 | 0.00 | 3. |
| 36 15 | .06 | 0.00 | 3. |
| 36 30 | .06 | 0.00 | 3. |
| 36 45 | .06 | 0.00 | 3. |
| 36 50 | .06 | 0.00 | 3. |
| 36 55 | .06 | 0.00 | 3. |
| 37 00 | .06 | 0.00 | 3. |
| 37 15 | .06 | 0.00 | 3. |
| 37 30 | .06 | 0.00 | 3. |
| 37 45 | .06 | 0.00 | 3. |
| 37 50 | .06 | 0.00 | 3. |
| 37 55 | .06 | 0.00 | 3. |
| 38 00 | .06 | 0.00 | 3. |
| 38 15 | .06 | 0.00 | 3. |
| 38 30 | .06 | 0.00 | 3. |
| 38 45 | .06 | 0.00 | 3. |
| 38 50 | .06 | 0.00 | 3. |
| 38 55 | .06 | 0.00 | 3. |
| 39 00 | .06 | 0.00 | 3. |
| 39 15 | .06 | 0.00 | 3. |
| 39 30 | .06 | 0.00 | 3. |
| 39 45 | .06 | 0.00 | 3. |
| 39 50 | .06 | 0.00 | 3. |
| 39 55 | .06 | 0.00 | 3. |
| 40 00 | .06 | 0.00 | 3. |
| 40 15 | .06 | 0.00 | 3. |
| 40 30 | .06 | 0.00 | 3. |
| 40 45 | .06 | 0.00 | 3. |
| 40 50 | .06 | 0.00 | 3. |
| 40 55 | .06 | 0.00 | 3. |
| 41 00 | .06 | 0.00 | 3. |
| 41 15 | .06 | 0.00 | 3. |
| 41 30 | .06 | 0.00 | 3. |
| 41 45 | .06 | 0.00 | 3. |
| 41 50 | .06 | 0.00 | 3. |
| 41 55 | .06 | 0.00 | 3. |
| 42 00 | .06 | 0.00 | 3. |
| 42 15 | .06 | 0.00 | 3. |
| 42 30 | .06 | 0.00 | 3. |
| 42 45 | .06 | 0.00 | 3. |
| 42 50 | .06 | 0.00 | 3. |
| 42 55 | .06 | 0.00 | 3. |
| 43 00 | .06 | 0.00 | 3. |
| 43 15 | .06 | 0.00 | 3. |
| 43 30 | .06 | 0.00 | 3. |
| 43 45 | .06 | 0.00 | 3. |
| 43 50 | .06 | 0.00 | 3. |
| 43 55 | .06 | 0.00 | 3. |
| 44 00 | .06 | 0.00 | 3. |
| 44 15 | .06 | 0.00 | 3. |
| 44 30 | .06 | 0.00 | 3. |
| 44 45 | .06 | 0.00 | 3. |
| 44 50 | .06 | 0.00 | 3. |
| 44 55 | .06 | 0.00 | 3. |
| 45 00 | .06 | 0.00 | 3. |
| 45 15 | .06 | 0.00 | 3. |
| 45 30 | .06 | 0.00 | 3. |
| 45 45 | .06 | 0.00 | 3. |
| 45 50 | .06 | 0.00 | 3. |
| 45 55 | .06 | 0.00 | 3. |
| 46 00 | .06 | 0.00 | 3. |
| 46 15 | .06 | 0.00 | 3. |
| 46 30 | .06 | 0.00 | 3. |
| 46 45 | .06 | 0.00 | 3. |
| 46 50 | .06 | 0.00 | 3. |
| 46 55 | .06 | 0.00 | 3. |
| 47 00 | .06 | 0.00 | 3. |
| 47 15 | .06 | 0.00 | 3. |
| 47 30 | .06 | 0.00 | 3. |
| 47 45 | .06 | 0.00 | 3. |
| 47 50 | .06 | 0.00 | 3. |
| 47 55 | .06 | 0.00 | 3. |
| 48 00 | .06 | 0.00 | 3. |
| 48 15 | .06 | 0.00 | 3. |
| 48 30 | .06 | 0.00 | 3. |
| 48 45 | .06 | 0.00 | 3. |
| 48 50 | .06 | 0.00 | 3. |
| 48 55 | .06 | 0.00 | 3. |
| 49 00 | .06 | 0.00 | 3. |
| 49 15 | .06 | 0.00 | 3. |
| 49 30 | .06 | 0.00 | |

| | | |
|------|------|-------|
| 1.37 | 1.31 | 6733 |
| 1.37 | 1.31 | 8240 |
| 1.07 | 1.01 | 9747 |
| 1.07 | 1.01 | 10948 |
| .03 | .03 | 11738 |
| .03 | .03 | 12035 |
| .03 | .03 | 11642 |
| .03 | .03 | 10887 |
| .03 | .03 | 9846 |
| .03 | .03 | 8722 |
| .03 | .03 | 7600 |
| .03 | .03 | 6535 |
| .03 | .03 | 5601 |
| .03 | .03 | 4804 |
| .03 | .03 | 4124 |
| .03 | .03 | 3544 |
| .00 | .00 | 3055 |
| .00 | .00 | 2620 |
| .00 | .00 | 2225 |
| .00 | .00 | 1944 |
| .00 | .00 | 1672 |
| .00 | .00 | 1433 |
| .00 | .00 | 1222 |
| .00 | .00 | 1166 |
| .00 | .00 | 1114 |
| .00 | .00 | 1070 |
| .00 | .00 | 1027 |
| .00 | .00 | 987 |
| .00 | .00 | 947 |
| .00 | .00 | 910 |
| .00 | .00 | 874 |
| .00 | .00 | 839 |
| .00 | .00 | 806 |
| .00 | .00 | 774 |
| .00 | .00 | 743 |
| .00 | .00 | 713 |
| .00 | .00 | 685 |
| .00 | .00 | 659 |
| .00 | .00 | 633 |
| .00 | .00 | 606 |
| .00 | .00 | 582 |
| .00 | .00 | 559 |
| .00 | .00 | 537 |
| .00 | .00 | 516 |
| .00 | .00 | 495 |
| .00 | .00 | 474 |
| .00 | .00 | 457 |
| .00 | .00 | 438 |
| .00 | .00 | 421 |
| .00 | .00 | 404 |
| .00 | .00 | 388 |
| .00 | .00 | 373 |
| .00 | .00 | 358 |
| .00 | .00 | 344 |
| .00 | .00 | 330 |
| .00 | .00 | 317 |
| .00 | .00 | 304 |
| .00 | .00 | 292 |
| .00 | .00 | 281 |
| .00 | .00 | 270 |
| .00 | .00 | 259 |
| .00 | .00 | 249 |
| .00 | .00 | 239 |
| .00 | .00 | 229 |
| .00 | .00 | 220 |
| .00 | .00 | 211 |
| .00 | .00 | 203 |
| .00 | .00 | 195 |
| .00 | .00 | 187 |
| .00 | .00 | 180 |
| .00 | .00 | 173 |
| .00 | .00 | 165 |
| .00 | .00 | 159 |
| .00 | .00 | 153 |
| .00 | .00 | 147 |
| .00 | .00 | 141 |
| .00 | .00 | 135 |
| .00 | .00 | 130 |
| .00 | .00 | 124 |
| .00 | .00 | 120 |
| .00 | .00 | 115 |
| .00 | .00 | 110 |
| .00 | .00 | 105 |
| .00 | .00 | 102 |
| .00 | .00 | 98 |
| .00 | .00 | 94 |
| .00 | .00 | 90 |

| | | | | |
|----|----|------|------|------|
| 3 | 30 | 0.00 | 0.00 | 0.00 |
| 12 | 30 | 0.00 | 0.00 | 0.00 |
| 12 | 30 | 0.00 | 0.00 | 0.00 |
| 13 | 30 | 0.00 | 0.00 | 0.00 |
| 13 | 30 | 0.00 | 0.00 | 0.00 |
| 14 | 30 | 0.00 | 0.00 | 0.00 |
| 14 | 30 | 0.00 | 0.00 | 0.00 |
| 15 | 30 | 0.00 | 0.00 | 0.00 |
| 15 | 30 | 0.00 | 0.00 | 0.00 |
| 16 | 30 | 0.00 | 0.00 | 0.00 |
| 16 | 30 | 0.00 | 0.00 | 0.00 |
| 17 | 30 | 0.00 | 0.00 | 0.00 |
| 17 | 30 | 0.00 | 0.00 | 0.00 |
| 18 | 30 | 0.00 | 0.00 | 0.00 |
| 18 | 30 | 0.00 | 0.00 | 0.00 |
| 19 | 30 | 0.00 | 0.00 | 0.00 |
| 19 | 30 | 0.00 | 0.00 | 0.00 |
| 20 | 30 | 0.00 | 0.00 | 0.00 |
| 20 | 30 | 0.00 | 0.00 | 0.00 |
| 21 | 30 | 0.00 | 0.00 | 0.00 |
| 21 | 30 | 0.00 | 0.00 | 0.00 |
| 22 | 30 | 0.00 | 0.00 | 0.00 |
| 22 | 30 | 0.00 | 0.00 | 0.00 |
| 23 | 30 | 0.00 | 0.00 | 0.00 |
| 23 | 30 | 0.00 | 0.00 | 0.00 |

SUM 23.42 20.51 198783.

| CFS | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|--------|--------|--------|---------|---------|--------------|
| INCHES | 12035. | 9575. | 3772. | 1380. | 198779. |
| AC-FT | | 13.29 | 20.45 | 23.00 | 23.00 |
| | | 4750. | 7486. | 8218. | 8218. |

| RUNOFF MULTIPLIED BY .50 | | | | | | | |
|--------------------------|-------|-------|-------|-------|-------|-------|-------|
| 2. | 2. | 2. | 2. | 2. | 2. | 1. | 1. |
| 25. | 30. | 33. | 36. | 39. | 42. | 11. | 11. |
| 1988. | 2620. | 3356. | 4145. | 4883. | 5893. | 1135. | 1509. |
| 4924. | 4364. | 3801. | 3269. | 2801. | 2402. | 5847. | 5444. |
| 1132. | 974. | 836. | 715. | 610. | 580. | 1527. | 1315. |
| 474. | 455. | 437. | 419. | 403. | 387. | 514. | 493. |
| 316. | 303. | 291. | 280. | 269. | 258. | 342. | 329. |
| 211. | 202. | 194. | 186. | 179. | 172. | 224. | 219. |
| 140. | 135. | 129. | 124. | 119. | 115. | 152. | 146. |
| 94. | 90. | 86. | 83. | 80. | 78. | 101. | 97. |
| 62. | 60. | 58. | 55. | 53. | 51. | 68. | 65. |
| 42. | 40. | 38. | 37. | 35. | 34. | 45. | 43. |
| 28. | 27. | 26. | 25. | 24. | 23. | 30. | 29. |
| 18. | 18. | 17. | 16. | | | 20. | 19. |

| CFS | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|--------|-------|--------|---------|---------|--------------|
| INCHES | 6018. | 4707. | 1886. | 690. | 93390. |
| AC-FT | | 5.65 | 10.48 | 11.50 | 11.50 |
| | | 2375. | 3743. | 4109. | 4109. |

HYDROGRAPH ROUTING

| RESERVOIR ROUTING--MILES | ROAD DAM | | | | | |
|--------------------------|----------|-------|-------|-------|-------|-------|
| ISTAQ | ICOMP | IECCN | ITAPE | JPLT | LPRT | INAME |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| ROUTING DATA | | | | | | |
| ULOSS | CLOSS | AVG | IRIS | ISAME | | |
| 0.0 | 0.000 | 0.00 | 1 | 0 | | |
| NSTPS | NSTOL | LAG | AMSKK | TSK | STORA | |
| 1 | 0 | 0 | 0.000 | 0.000 | 0.000 | -1. |

| STORAGE | 1367. | 1500. | 1715. | 1925. | 2199. | 2350. | 2560. | 2775. | 2940. | 3200. |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|
| OUTFLC | 0. | 11. | 363. | 944. | 2154. | 3109. | 5403. | 8284. | 11636. | 15392. |


| TIME | EOP | STOR | AVG | IN | EOP | OUT |
|------|-----|-------|-----|----|-----|-----|
| 0 | 30 | 1390. | 2. | 2. | 2. | 2. |
| 0 | 40 | 1390. | 2. | 2. | 2. | 2. |
| 1 | 30 | 1390. | 2. | 2. | 2. | 2. |
| 1 | 40 | 1390. | 2. | 2. | 2. | 2. |
| 2 | 30 | 1390. | 2. | 2. | 2. | 2. |
| 2 | 40 | 1390. | 2. | 2. | 2. | 2. |
| 3 | 30 | 1390. | 2. | 2. | 2. | 2. |
| 3 | 40 | 1390. | 2. | 2. | 2. | 2. |
| 4 | 30 | 1390. | 2. | 2. | 2. | 2. |
| 4 | 40 | 1390. | 2. | 2. | 2. | 2. |
| 5 | 30 | 1390. | 2. | 2. | 2. | 2. |
| 5 | 40 | 1390. | 2. | 2. | 2. | 2. |
| 6 | 30 | 1390. | 2. | 2. | 2. | 2. |
| 6 | 40 | 1390. | 2. | 2. | 2. | 2. |

| | | |
|-------|-------|-------|
| 1361. | 14. | 7. |
| 1363. | 40. | 22. |
| 1365. | 70. | 22. |
| 1400. | 104. | 3. |
| 1406. | 154. | 3. |
| 1416. | 201. | 5. |
| 1424. | 245. | 5. |
| 1436. | 285. | 6. |
| 1449. | 319. | 7. |
| 1463. | 348. | 8. |
| 1478. | 381. | 9. |
| 1496. | 440. | 11. |
| 1518. | 551. | 40. |
| 1545. | 729. | 85. |
| 1581. | 986. | 144. |
| 1628. | 1322. | 221. |
| 1689. | 1744. | 321. |
| 1767. | 2304. | 518. |
| 1863. | 2983. | 805. |
| 1977. | 3756. | 1210. |
| 2102. | 4514. | 1746. |
| 2232. | 5189. | 2366. |
| 2363. | 5694. | 3146. |
| 2495. | 5955. | 4180. |
| 2628. | 6055. | 4826. |
| 2753. | 5184. | 5148. |
| 2870. | 4644. | 4963. |
| 2979. | 4083. | 4639. |
| 3081. | 3535. | 4232. |
| 3176. | 3033. | 3791. |
| 3263. | 2601. | 3353. |
| 3343. | 2232. | 3003. |
| 3416. | 1918. | 2753. |
| 3482. | 1650. | 2499. |
| 3541. | 1421. | 2251. |
| 3593. | 1223. | 2057. |
| 3639. | 1053. | 1874. |
| 3678. | 902. | 1734. |
| 3711. | 776. | 1578. |
| 3738. | 663. | 1430. |
| 3759. | 555. | 1295. |
| 3774. | 459. | 1177. |
| 3783. | 366. | 1075. |
| 3787. | 274. | 986. |
| 3786. | 183. | 910. |
| 3780. | 93. | 878. |
| 3769. | 464. | 810. |
| 3753. | 446. | 786. |
| 3732. | 428. | 744. |
| 3706. | 395. | 706. |
| 3675. | 374. | 670. |
| 3640. | 364. | 636. |
| 3601. | 350. | 605. |
| 3558. | 338. | 575. |
| 3512. | 326. | 547. |
| 3463. | 310. | 521. |
| 3411. | 297. | 497. |
| 3356. | 284. | 474. |
| 3300. | 274. | 452. |
| 3241. | 263. | 431. |
| 3179. | 253. | 410. |
| 3114. | 244. | 393. |
| 3047. | 233. | 376. |
| 2978. | 224. | 361. |
| 2907. | 217. | 347. |
| 2833. | 209. | 333. |
| 2757. | 199. | 320. |
| 2679. | 189. | 308. |
| 2599. | 179. | 299. |
| 2516. | 168. | 289. |
| 2431. | 158. | 280. |
| 2344. | 147. | 272. |
| 2255. | 136. | 264. |
| 2164. | 125. | 257. |
| 2071. | 114. | 250. |
| 1976. | 103. | 243. |
| 1879. | 92. | 236. |
| 1780. | 81. | 230. |
| 1679. | 70. | 224. |
| 1576. | 59. | 218. |
| 1471. | 48. | 212. |
| 1364. | 37. | 206. |
| 1255. | 26. | 200. |
| 1144. | 15. | 194. |
| 1031. | 4. | 188. |
| 916. | 3. | 182. |
| 800. | 2. | 176. |
| 683. | 1. | 170. |
| 565. | 0. | 164. |
| 446. | 0. | 158. |
| 327. | 0. | 152. |
| 208. | 0. | 146. |
| 90. | 0. | 140. |
| 0. | 0. | 134. |
| 0. | 0. | 128. |
| 0. | 0. | 122. |
| 0. | 0. | 116. |
| 0. | 0. | 110. |
| 0. | 0. | 104. |
| 0. | 0. | 98. |
| 0. | 0. | 92. |
| 0. | 0. | 86. |
| 0. | 0. | 80. |
| 0. | 0. | 74. |
| 0. | 0. | 68. |
| 0. | 0. | 62. |
| 0. | 0. | 56. |
| 0. | 0. | 50. |
| 0. | 0. | 44. |
| 0. | 0. | 38. |
| 0. | 0. | 32. |
| 0. | 0. | 26. |
| 0. | 0. | 20. |
| 0. | 0. | 14. |
| 0. | 0. | 8. |
| 0. | 0. | 2. |
| 0. | 0. | 0. |

| | | | | | | | |
|--------|-------|---------|--------|---------|------|--------------|--------|
| | 30 | 1400. | 83. | 174. | | | |
| | 60 | 1566. | 85. | 168. | | | |
| | 90 | 1553. | 81. | 163. | | | |
| | 120 | 1589. | 79. | 152. | | | |
| | 150 | 1583. | 72. | 146. | | | |
| | 180 | 1580. | 69. | 141. | | | |
| | 210 | 1577. | 66. | 136. | | | |
| | 240 | 1574. | 64. | 132. | | | |
| | 270 | 1571. | 60. | 127. | | | |
| | 300 | 1568. | 59. | 123. | | | |
| | 330 | 1564. | 56. | 118. | | | |
| | 360 | 1563. | 54. | 114. | | | |
| | 390 | 1560. | 52. | 110. | | | |
| | 420 | 1558. | 50. | 106. | | | |
| | 450 | 1556. | 48. | 102. | | | |
| | 480 | 1554. | 46. | 99. | | | |
| | 510 | 1551. | 44. | 95. | | | |
| | 540 | 1549. | 42. | 92. | | | |
| | 570 | 1547. | 41. | 88. | | | |
| | 600 | 1545. | 39. | 85. | | | |
| | 630 | 1543. | 38. | 82. | | | |
| | 660 | 1542. | 35. | 76. | | | |
| | 690 | 1543. | 33. | 73. | | | |
| | 720 | 1546. | 32. | 71. | | | |
| | 750 | 1545. | 31. | 68. | | | |
| | 780 | 1543. | 29. | 65. | | | |
| | 810 | 1542. | 28. | 63. | | | |
| | 840 | 1540. | 26. | 58. | | | |
| | 870 | 1538. | 25. | 56. | | | |
| | 900 | 1536. | 24. | 54. | | | |
| | 930 | 1535. | 23. | 52. | | | |
| | 960 | 1534. | 21. | 48. | | | |
| | 990 | 1532. | 20. | 46. | | | |
| | 1020 | 1531. | 20. | 45. | | | |
| | 1050 | 1530. | 19. | 43. | | | |
| | 1080 | 1529. | 18. | 41. | | | |
| | 1110 | 1528. | 17. | 40. | | | |
| | 1140 | 1517. | 17. | 38. | | | |
| SUM | | | 96341. | | | | |
| PEAK | 5148. | 6-HOUR | 4097. | 72-HOUR | 669. | TOTAL VOLUME | 96341. |
| INCHES | 5.64 | 24-HOUR | 9.90 | 11.15 | | | 11.15 |
| AC-FT | 2033. | 3539. | 3983. | | | | 3983. |

| RUNOFF SUMMARY. AVERAGE FLOW | | | | | | |
|------------------------------|---|-------|--------|---------|---------|------|
| HYDROGRAPH AT | 1 | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | AREA |
| ROUTED TO | 0 | 5148. | 4097. | 1783. | 669. | 6.70 |

APPENDIX E
INFORMATION AS CONTAINED IN THE
NATIONAL INVENTORY OF DAMS



PART I - INVENTORY OF DAMS IN THE UNITED STATES
(PURSUANT TO PUBLIC LAW 92-367)

See reverse side for instructions.

| FORM APPROVED OMB NO. 43-R0421 | | IDENTITY NUMBER | |
|--|---|--------------------|----|
| REQUIREMENTS CONTROL SYMBOL DAEN-CWE-17 | | STATE | ID |
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 0 | 1 | 2 |
| 3 | 4 | 5 | 6 |
| 7 | 8 | 9 | 0 |
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 0 | 1 | 2 |
| 3 | 4 | 5 | 6 |
| 7 | 8 | 9 | 0 |
| 1 | 2 | 3 | 4 |
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| 7 | 8 | 9 | 0 |
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| 5 | 6 | 7 | 8 |
| 9 | 0 | 1 | 2 |
| 3 | 4 | 5 | 6 |
| 7 | 8 | 9 | 0 |
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| 5 | 6 | 7 | 8 |
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| 3 | 4 | 5 | 6 |
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| 5 | 6 | 7 | 8 |
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| 3 | 4 | 5 | 6 |
| 7 | 8 | 9 | 0 |
| 1 | 2 | 3 | 4 |
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| 9 | 0 | 1 | 2 |
| 3 | 4 | 5 | 6 |
| 7 | 8 | 9 | 0 |
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[illegible][illegible][illegible][illegible]

| REMARKS | | REMARKS | |
|---------|--|---------|--|
| B | 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 | | |

GENERAL INSTRUCTIONS

This form is for use in preparing the inventory of dams in the United States under the requirements of the National Program for the Inspection of Dams, P.L. 92-367. All items of Part I and Part II (Lines 0-9) must be completed as instructed below. Print entries distinctly in ink or pencil. For letters o, z, and s, write O, Z, and I.

Write only one letter or numeral in each space; do not use more letters than blocks allowed for an item. Do not abbreviate on Part I. Leave one space between words and no space between code letters.

For all letter codes or word entries place first letters in left block of field. In word fields any alphabetic, numeric or special character may be entered. For all numerical entries, use only numerals placing the last digit of number in the right block of field, including trailing zeros. Do not include a decimal point! In fields where decimals are required values are to be placed around the decimal point printed on the form.

Leave blank those spaces where item does not apply, e.g., do not write "N/A", "...", "None", etc., unless instructed to do so by specific instructions. Use the remarks line when additional space is needed for an item, or to clarify an entry. Preface each remark with the item number. (See item 128 for 561 instructions)

PART I

Item 101 IDENTITY. The Division Engineer will assign and control the identity for dams in the states for which he is responsible. The first two characters of the identity will be the two-letter state abbreviation in accordance with Federal Information Processing Standards Publication, June 15, 1970 (FIPS PUB 6-1). In cases where a dam is physically located in two or more states, one state will be designated as the principal state for the identity. The last five (5) characters of the identity will be a sequential number assigned to identify dams within a state.

LINE 0

Item 121 DIVISION. Enter the three (3) letter office symbol for the Division making the report in accordance with ABBR Report Code, Appendix B, ER 18-2-1, Civil Works Information System, e.g., NAD, ORD, SWD, etc.

Location

Item 101 STATE. Enter two (2) letter principal state abbreviation in accordance with FIPS PUB 6-1.

Item 101 COUNTY. Enter three (3) digit county identification in accordance with FIPS PUB 6-1.

Item 101 CONG DIST. Enter one (1) or two (2) digit number for congressional districts in which dam is located.

Item 101 J, J', and J''. Use second location for structures situated in more than one state.

Item 101 DAM NAME. Enter official name of dam. Do not abbreviate unless the abbreviation is a part of the official name. For dams that do not have a name, create a name by combining the two (2) letter state abbreviation plus "NO NAME" plus a sequential number. Example: If two dams in the State of Alabama do not have names, they would be named as ALNONAME1 and ALNONAME2.

Item 101 1011 LATITUDE AND LONGITUDE. Enter the latitude and longitude in degrees, minutes and tenths of a minute. All geographical location items pertain to dam as its maximum section.

Item 101 REPORT DATE. Enter the one (1) or two (2) digits for day, the first three (3) letters of the month and a two (2) digit year (e.g., 12 JAN 74) in which the data has been revised, updated or otherwise changed.

LINE 1

Item 101 POPULAR NAME OF DAM. If (other than the official name of the dam) in common use, enter the name in this space. Leave blank if not applicable.

Item 101 NAME OF IMPOUNDMENT. Enter official name of lake or reservoir. Leave blank if reservoir does not have a name.

Item 101 REGION AND BASIN. Enter two (2) digit numbers for Region and Basin in accordance with Appendix C, ER 18-2-1, Civil Works Information System.

Item 101 RIVER OR STREAM. Enter official name of river or stream on which the dam is built. If stream is without name, indicate as tributary to river named, e.g., TR-COLORADO. If off stream, enter name of river plus "OFF-STREAM".

Item 101 NAREST DOWNSTREAM CITY-TOWN-VILLAGE. Enter the nearest downstream city-town-village of such size which can be located on a general map.

Item 101 DISTANT FROM DAM. Enter distance from dam to nearest downstream city-town-village to the nearest mile.

Item 101 POPULATION. Enter population of city-town-village given in item 101.

LINE 2

Item 121 TYPE OF DAM. Enter two (2) letter codes, in any order, to describe type of dam.

| | | | | | |
|----------|----|------------|----|-------------------------------|----|
| EARTH | RI | BUTRESS | CB | OTHER | OT |
| ROCK/ILL | IR | ARCH | VA | (Describe "other" in remarks) | |
| GRAVITY | PG | MULTI-ARCH | MV | | |

Item 121 YEAR COMPLETED. Enter year when the main dam structure was completed and ready for use. If only approximate year can be determined, note this in remarks.

Item 121 PURPOSES. Enter one (1) letter codes that describe the purposes for which the reservoir is used. The order entered should indicate the relative decreasing importance of the project purposes.

| | | | | | |
|---------------|---|----------------|---|-------------------------------|---|
| IRRIGATION | I | WATER SUPPLY | S | DEBRIS CONTROL | D |
| HYDROELECTRIC | H | RECREATION | R | OTHER | O |
| FLOOD CONTROL | C | STOCK OR SMALL | | (Describe "other" in remarks) | |
| NAVIGATION | N | FARM POND | P | | |

Item 121 STRUCTURAL HEIGHT. Enter, to the nearest foot, the structural height of the dam which is defined as: the overall vertical distance from the lowest point of foundation surface to the top of the dam.

Item 121 HYDRAULIC HEIGHT. Enter, to the nearest foot, the hydraulic height of the dam which is defined as: the effective height of the dam with respect to the maximum storage capacity, measured from the natural bed of the stream or watercourse at the downstream toe of the barrier, or if it is not across a stream or watercourse, the height from the lowest elevation of the outside limit of the barrier to the maximum storage elevation.

Impounding Capabilities

Item 121 MAXIMUM. Enter the acre feet for maximum storage which is defined as: the total storage space in a reservoir below the maximum attainable water surface elevation, including any surcharge storage.

Item 121 NORMAL. Enter the acre feet for normal storage which is defined as: the total storage space in a reservoir below the normal retention level, including dead and inactive storage and excluding any flood control or surcharge storage.

Item 121 CORPS OF ENGINEERS DISTRICT. Enter the three character Corps of Engineers ABBR report code in which the dam is geographically located, in accordance with Appendix B, ER 19-2-1, Civil Works Information System, e.g., NAD, ORD, SWD, etc.

Item 121 OWNERSHIP. Enter N for Non-Federal, G for Federal Gov't. Agencies other than the Corps of Engineers, C for Corps of Engineers.

Item 121 FEDERALLY REGULATED. Enter N for No, Enter Y for Yes.

Item 121 PRIVATE DAMS ON FEDERAL LAND. Enter N for No, Enter Y for Yes.

Item 121 ASSISTANCE BY SOIL CONSERVATION SERVICE. Enter N for None, Enter Y for Technical Assistance, T for Financial Assistance, B for Both Technical and Financial Assistance.

Item 121 VERIFICATION. Date the data was verified as being complete and correct. Enter date as described in item 101.

LINE 4

Item 121 REMARKS. Preface remarks with the item number to which it pertains, e.g., 224-ORIGINALLY CONSTRUCTED IN 1928, 23 SETTLING BASIN. Only one remark line should be used for PART I remarks.

III

FORM APPROVED
OMB NO. 49-R0421
REQUIREMENTS CONTROL SYMBOL

[29] [30] [31] [32] [33] [34] [35] [36] [37] [38] [39] [40] [41] [42] [43] [44] [45]

[48][52]1551156 11REMARKS

Item 1 **IDENTITY:** Enter identity per **GENERAL INSTRUCTIONS** on **PART I**.

PART II:

LINE 5:

Item [10] **D/S HAZ:** Enter the digit that most closely represents the hazard potential that could occur to the downstream (D/S) area resulting from failure or mis-operation of the dam or facilities.

HAZARD POTENTIAL

| CATEGORY | LOSS OF LIFE (Extent of Development) | | ECONOMIC LOSS (Extent of Development) | |
|-----------------|--|--|---|---|
| | None expected (No permanent structures for human habitation) | Some expected (No permanent structures for human habitation) | Minimal (Undeveloped or occasional structures or agriculture) | Appreciable (Notable agriculture, industry or structures) |
| 3 - Low | | | | |
| 2 - Significant | | | | |
| 1 - High | | | | |

Item [10] **CREST LENGTH:** Enter, to the nearest foot, the crest length of the dam which is defined as: The total horizontal distance measured along the axis at the elevation of the top of dam between abutments or ends of dam. Note that this includes spillway width, powerhouse sections, and navigation locks where they form a continuous part of the dam water retaining structure. Detached spillways, locks, and powerhouses shall not be included.

Spillway:

Item [10] **TYPE:** Enter the one letter code that applies.

CONTROLLED = C UNCONTROLLED = U NONE = N

Item [10] **WIDTH:** Enter to the nearest foot, the width of the spillway available for discharge when the reservoir is at its maximum designed water surface elevation.

Item [10] **MAXIMUM DISCHARGE:** Enter the number of cubic feet per second which the spillway is capable of discharging when the reservoir is at its maximum designed water surface elevation.

Volume of Dam:

Item [10] **VOLUME OF DAM:** Enter the total number of cubic yards occupied by the materials used in the dam structure. If volume of separate materials is known, enter in remarks. Include portions of powerhouses, locks and spillways only if integral with the dam and required for structural stability.

Power Capacity:

Item [10] **INSTALLED:** Enter installed capacity to one tenth (1/10) Megawatt as of the report date.

Item [10] **PROPOSED:** Enter the future additional capacity proposed to one tenth (1/10) Megawatt.

Navigation Locks:

Item [17] **NUMBER:** Enter the number of existing navigation locks for the project.

Item [18] **LENGTH:** Enter to the nearest foot the length of the navigation lock.

Item [19] **WIDTH:** Enter to the nearest foot the width of the navigation lock.

Item [40] thru [45] Enter the lengths and widths of additional locks.

LINE 6:

Item [46] **OWNER:** Enter name of owner. Abbreviate as necessary.

Item [47] **ENGINEERING BY:** Enter name of organization that engineered the main dam structure. Abbreviate as required.

Item [48] **CONSTRUCTION BY:** Enter name of construction agency responsible for construction of main structure. Abbreviate as required.

LINE 7:

Regulatory Agency:

Item [49] **DESIGN:** Enter the name of the organization other than the owner having regulatory or approval authority over the design of the dam. If no organization other than the owner has regulatory or approval authority over the design of the dam indicate NONE.

Item [50] **CONSTRUCTION:** Enter the name of the organization other than the owner having regulatory authority or inspection responsibilities over the construction of the dam. If no organization other than the owner has regulatory authority or inspection responsibilities over the construction of the dam indicate NONE.

Item [51] **OPERATION:** Enter the name of the organization other than the owner having regulatory authority, operational control, or surveillance responsibilities over the operation of the dam. If no organization other than the owner has regulatory authority, operational control or surveillance responsibilities over the operation of the dam indicate NONE.

Item [52] **MAINTENANCE:** Enter the name of the organization other than the owner having regulatory authority or inspection or surveillance responsibilities over the maintenance of the dam. If no organization other than the owner has regulatory authority or inspection or surveillance responsibilities over the maintenance of the dam indicate NONE.

LINE 8:

Inspection:

Item [53] **BY:** Enter the name of the organization that performed the last safety inspection. Abbreviate as required. If no inspection has been performed enter NONE.

Item [54] **DATE:** Enter the one (1) or two (2) digits for day, the first three (3) letters of the month and a two (2) digit year when the inspection was performed. If not applicable, leave blank.

Item [55] **AUTHORITY FOR INSPECTION:** Enter the legislative or regulatory authority for performing the inspection indicated in item 53, e.g., P.L. 92-367; Dm 3; Water Code; State of Calif. F.R. 1110-2-100; etc.

LINE 9:

Item [56] **REMARKS:** Prefix remarks with the item number to which it pertains e.g., 34.2, 500,000 c.y. conc. 475,000 c.y. carthill. Only one Remarks line should be used for PART II remarks.

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| PART III - INVENTORY OF DAMS IN THE UNITED STATES | | | | | | | | | | | | | | |
| SUPPLEMENTARY DATA | | | | | | | | | | | | | | |
| STATE | | | | | | | | | | | | | | |
| VT 00162 | | | | | | | | | | | | | | |
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| LOCATION | | | | | | | | | | | | | | |
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| DRAINAGE CHARACTERISTICS | | | | | | | | | | | | | | |
| DRAINAGE AREA SQ MI | | | | | | | | | | | | | | |
| FLOW DATA | | | | | | | | | | | | | | |
| RAIN CFS | | | | | | | | | | | | | | |
| AVE CFS | | | | | | | | | | | | | | |
| MAX CFS | | | | | | | | | | | | | | |
| CREST ELEV MSL | | | | | | | | | | | | | | |
| ABUT. ELEV MSL | | | | | | | | | | | | | | |
| USABLE STORAGE ACRES | | | | | | | | | | | | | | |
| RESERVOIR AREA ACRES | | | | | | | | | | | | | | |
| FLASH BOARD FT | | | | | | | | | | | | | | |
| OUTLET CONDUITS | | | | | | | | | | | | | | |
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| POWER DATA | | | | | | | | | | | | | | |
| GENERATION UNITS | | | | | | | | | | | | | | |
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| PLANNED CAP KW | | | | | | | | | | | | | | |
| AVERAGE ANNUAL GENERATION KWH | | | | | | | | | | | | | | |
| LAST GEN YEAR | | | | | | | | | | | | | | |
| RETIRED YEAR | | | | | | | | | | | | | | |
| FORMER USE | | | | | | | | | | | | | | |
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